THE

Practical Teacher

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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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The Teacher's Health.

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THE EYES.

A VOLUME might be devoted to this subject; nay, a dozen volumes would not exhaust all that might be written upon the management of the eyes, and the mischiefs they are exposed to by improper use. I propose to restrict myself in this paper to the injuries and diseases which affect them more particularly in connection with daily school-life, and which often do not require the aid of the ophthalmic surgeon to remove if they are treated early, with common sense. Optical defects may of course arise in children as well as in teachers. The circumstances which often bring them about, and which the teacher's want of knowledge as to the first causes assist to make worse, are those which are closely connected with the customs of school-life; they are those which I shall more especially deal with, but I shall also refer to diseases which are common among children. I shall conclude this chapter with practical suggestions for the care of the eyesight.

Injuries.—The most common injury, showing itself by sudden and acute pain, is often produced by particles of steel or iron from the flange of a locomotive or other sources, upon a railway or high road, or by a portion of slag or coal from the furnace of the engine, or a piece of grit from a dusty road, sticking into the cornea. Impinging in the first instance upon the ball of the eye, it is immediately wiped away by the eyelid and sticks into the conjunctiva, which is the mucous membrane covering the eyeball and the eyelids. There is generally acute pain, the lids close convulsively, and efforts to remove the offending cause only tend to increase the irritation and spasmodic closure of the lids; perhaps the grit or iron spike may stick into the membrane which lines the cornea. It then only causes pain when the lid is shut, as when winking. If the foreign body is embraced by the lower lid there is no difficulty in removing it. The corner of the pocket-handkerchief will wipe it out if the lid be everted. It is often found to be a small insect whose sting is transient in its effects. When the particle is beneath the upper lid the process is not so easy: the lid must be raised and turned upwards. It may be done by means of a bodkin or fine knitting-needle, the bodkin being placed above the lashes and pressed backwards against the ball of the eye, and then by means of the lashes the lid should be turned upwards upon the bodkin and its mucous membrane exposed. The foreign body will be seen in the centre of a patch of congested vessels which are in the membrane; that is, if there has been time enough for the onset of the inflammation which soon follows upon the intrusion of the foreign body. It is sometimes difficult to extract, but it may generally be wiped away by the border of a silk handkerchief or a fine piece of wash-leather. If the particle sticks into the cornea it is much more difficult to extract. It is not always easy to discover it, especially when it is a minute particle of bright steel or a fine flake of flint. Miners and other workmen engaged in ironworks are especially liable to this accident. They have a very safe method of removing the offending body. The miner sits down upon the ground, his mate kneels beside him, and, everting the eyelid, licks the cornea with his tongue, and thus scrapes out the offender without risking any injury to the eye. The surgeon picks out the object with the point of his lancet. The unskilled assistant had better not use a sharp instrument, but scrape it out by means of the eye of a needle, sticking the point of the needle into a large cork, and holding it firmly by that means. If the needle has been magnetized, and the offending object is a particle of steel, it may be more easily extracted; but the magnet is only likely to be useful in very rare instances, though the plan is sometimes put forward as a very neat use for that instrument. The foreign body being removed, it is only necessary to bathe the eye first with warm, and afterwards with cold water: all other applications are best let alone. The cause being removed, the effect will cease. If, however, the cause has been in operation for several days it may set up violent conjunctival inflammation, which expels the foreign body by means of the discharges which are produced, and then the inflammation itself becomes the more important disease: it generally goes by the name of Ophthalmia.

Ophthalmia is very often produced by the impaction of, or as the result of, foreign bodies. It may be produced by any injury to the eye, as a cut from the

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thong of a whip, or a sudden swish from a twig in getting through a hedge, as when boys are surprised in the unholy occupation of bird's-nesting or orchard-robbing. These injuries are best treated by the application of cold water. If the inflammation is superficial it will soon subside. If there is severe pain in the temples, and inability to bear the light, the mischief is deeper seated, and the patient will have to submit to a more rigorous treatment, which will require him to be kept in a room from which direct light is excluded by a green blind or some other means, so, however, that air shall not be kept out of the room. Much mischief is often done to the constitution by keeping the patient in a darkened room which is badly ventilated, and from which air as well as light is excluded. The teacher should look to this, and not allow a temporary mischief to be a means whereby a permanent injury may be done to the constitution. If there is supra-orbital pain and intolerance of light, skilled aid should be sought for.

Pustular ophthalmia is a painful form of disease, but if treated properly it may be cured without any evil result following; but if it be neglected the sight may be irretrievably injured. Pustules or pimples arise in the mucous membrane on the eyeball. If the ulcer which follows upon the pustule eats into the harder tissues, there may be acute pain. The condition is one which often attends upon teething in young children, and whilst the second eye-teeth, 'or canines' as they are generally called, are being perfected.

These teeth are developed between the ages of nine and twelve years of age. It is difficult to heal the ulcers until the teeth have cleared the gums. The general health must be especially attended to. The little circular ulcers which exist in the mucous membrane may be rendered less sensitive by filling them with a small quantity of calomel. Children having these pustules upon the eyes should not be kept at study, but encouraged to spend as much time as possible out of doors, whilst such tonics as steel, cod-liver oil, and hedozone may be safely administered.

Hedozone is an excellent diet-drink for such cases; it is far more advantageous than any form of wine or other alcoholic stimulant; whilst children like it. It is more easy of digestion than most forms of medicine in which steel enters as a part of their composition. Indeed, all cases in which steel is indicated or a strengthening tonic is required will be especially benefited by hedozone. I find it a much more digestible article than zoedone, besides being the first diet-drink of the kind which was manufactured. Those who are benefited by steel, who have pale faces, who want blood-tonics, who suffer from anæmic headaches, or who may require their arterial system to have its tension increased, will always find benefit from the use of hedozone, taking it either with their meals or as a draught of tonic waters at any time when most convenient. It is far more satisfactory than any kind of wine or malt liquor can be, and provided the bowels are not allowed to become confined, it will be certain to be beneficial, whilst it cannot damage the cell-tissue and the minute capillaries as alcoholic liquors may do. At the same time it is advantageous to have exercise in the open air, and to use fruits and vegetables freely. I never advise the use of caustics or of lead lotions. They increase the chance of scars upon the cornea, and may assist to damage it irretrievably. If care is taken to treat these ulcers properly, they do not lead to disfigurement.

Purulent ophthalmia, as mentioned in the first chapter of 'School Surgery,' is a much more serious malady. It must not be confounded with *catarrhal ophthalmia:* both are infectious, and both are at times epidemic. The latter is common among children, leading to what are called weak eyes if the child is made to use the organs when the conjunctiva is inflamed.

The epidemic form is sometimes kept up by the irritating effect of some kinds of pollen grains in some districts, causing a so-called hay-fever. An apparently similar state is sometimes produced in schools in which arsenic paper has been used upon the walls of the class-rooms. Either of these will give rise to the state in which the conjunctiva becomes 'granular.' The cause must be removed before the effect will cease.

The *purulent form* is a very serious one. It is very infectious, probably propagated by some micrococcus whose especial nidus is the conjunctival membrane. It can only be eradicated by the most persistent cleanliness and the continuous application of disinfectants and germicides, so that the germs which set up the purulent discharge may be completely destroyed. It is met with in great charity-schools, in which personal cleanliness has been neglected, and filth allowed to accumulate in the corners of the dormitories or elsewhere. It is one of the most frequent causes of blindness. Whenever a teacher finds a number of children in his school the subject of ophthalmia in any of its forms, I strongly advise him to get the aid of the medical officer of health, so that skilled assistance may be at once obtained to arrest the spread of the disease.

Opacities of the cornea, which are dull-looking spots upon the clear part of the eye, often follow upon these forms of inflammation. They cannot be remedied, and are better let alone. The accidental or designed introduction of quicklime and other acrid matters into the eye may lead to a serious form of inflammation, which may cause total loss of sight, or leave opacity of the cornea behind it, which sadly interferes with the function of the organ. This accident should be promptly met by the use of water, slightly acidulated with vinegar, and the application of sweet oil. If the irritant is a corrosive acid the wash should be water only, and pure oil should be then applied as quickly as possible. As soon as the irritating or corrosive matter is removed, and the part well oiled so that the lids cannot adhere together, the eye should be covered up with some carbolized lint or non-putrefactive material, and the patient kept in a dimly lighted room. If the pain subsides in a little time no great harm will be done. If the resulting inflammation is deep there may be serious, if not dangerous, mischief to the eye, which will require active treatment to subdue it.

Iritis is not uncommon; if neglected it frequently leads to serious injury, and even loss of sight. The Iris is the curtain of the eyeball which contracts or dilates the so-called pupil, and regulates the admission of light to the Retina. The Retina is the nervous coat which receives the image of the object looked at, and is on the posterior wall of the organ. If the tension of the curtain is interfered with by inflammation, and its muscular contractibility impeded, there is an absence of or an irregularity of contraction or dilation. The circular outline of the pupil is lost, and its colour

is changed. It is a serious disease. There is intolerance of light, supra-orbital pain (that is, pain in the temple), which is very troublesome at night, especially in the rheumatic form of the disease. It may be present without much interference with the general health, so that teachers have been known to carry on their duties whilst suffering from Iritis until the sight is quite lost by adhesion of the curtain to its neighbouring parts. The disease may arise from direct injury, such as by a blow; it may be the sequence of catarrhal or other forms of ophthalmia, or it may be syphilitic, rheumatic, or gouty in its origin. Each form will require different treatment, which the skilled surgeon can alone direct. It is curable if treated in time, but its cure is inconsistent with work. So that the subject of it must perforce give up the use of his eyes until the tension of the curtain is restored.

Cataract is caused by a change in the crystalline lens. The lens is placed behind the pupil; it is in shape something like to an acidulated drop, convex on both sides, and should be perfectly invisible. It changes its position nearer to or farther from the curtain of the pupil, according to the requirements of distance. By its means the light is focussed correctly. The pupil loses its natural blackness as the disease arises, and the lens becomes visible generally as a whitish-brown film behind the curtain. It can only be cured by the ophthalmic surgeon.

Glaucoma is a disease in which there is an interference with the secreting and absorbing powers of the apparatus of the eyeball, leading to its further deterioration. Its progress is sometimes checked by an operation which is called Iridectomy; but if it has led to change in the tissue of the nerve coat of the eye the case is hopeless.

Amaurosis is of this character, when the nerve is paralyzed or otherwise damaged by varicose states of the vascular coat. When absolute it is hopeless, but there is a temporary form produced by excessive smoking and other vicious habits, or in females by over lactation, which is curable if the cause can be discovered soon enough, and at once removed.

Muscæ volitantes, floating specks and vague images, taking the form of threads or spiders' webs, or even insects, are sometimes considered to be evidences of commencing amaurosis. They appear on the field of vision and fade away, or dance about to the terror of the victim. They are generally due to gastric or bilious disturbances, or to diseases of the vascular system. They may be cured by attention to the general health, and by the removal of the causes which are leading up to the mischief. They often cause great fear in the mind of the teacher. At times the fear is well founded, but much more generally they indicate temporary disturbance and errors of conduct or diet, which, if the warning be taken, will soon lead to the removal of the trouble, provided the cause is discovered and avoided in the future. They should not be neglected.

(*To be continued.*)

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Friedrich Fröbel.

BY HIS PUPIL, HERR HEINRICH HOFFMANN, KINDERGARTNER, ALTONA,
President of the Fröbel-Verein.

THURINGIA may justly be called the garden of Germany. Situated between the Harz and Fichtel mountains, and the rivers Saale and Werra, it comprises about 400 German square miles, with two millions of inhabitants. Of this territory 150 square miles belong to Prussia, and the remainder is divided among a number of minor powers.

There is finer scenery in other parts of Germany—in the Rhine district, for instance—yet Thuringia has charms of its own such as may be looked for in vain anywhere else. Gentle are the hills ('mountains' seems almost too grand a designation for those proud elevations), of matchless beauty are the valleys, the fertile plains, and the rich wood-covered uplands. The towns, too, like Rudolstadt, Eisenach, Ilmenau, Weimar, Gotha, and many others enrich our mind's picture-gallery with treasures of exquisite beauty, such as one delights to conjure up in hours of leisure, when recalling sunny memories of bygone days of happiness.

In one of the loveliest parts of this interesting country, high above the romantic hillside of the Schwarzathal, near Blankenburg and Rudolstadt, on a tributary brooklet of the Schwarza, a cosy little village presents itself—*Oberweissbach*. The houses have not the slightest pretension either to modern comfort and luxury or to architectural beauty, and as is commonly the case in all parts of Thuringia, are mostly built of wooden frames, painted in dark colours, with the brick or loam 'fillings' whitewashed, so as to give the appearance of geometrical figures. The village is very closely built, conveying the idea that every foot of ground is of priceless value. Right opposite its rather disproportionately large church there stands a long, straggling, and quite aristocratic-looking building. Whitewashed, solid walls distinguish it at once from the rest. The door is flanked on one side by three and on the other by five windows; nine windows are in the first storey, and several attics project from the high shingle-covered roof. This is the parsonage. It is closely surrounded by other houses, but possesses a lawn, a kitchen-garden, and a yard, all enclosed by walls, palings, or hedges. In the rear the view is shut in by the green slope of a mountain.

A hundred years ago there lived in this house a minister, who was much revered by his flock. His name was Johann Fröbel. He certainly could not speak of his living as a sinecure, since he had six villages under his charge, all at a considerable distance apart. Some five thousand people looked up to him as their faithful father, and their indefatigable, never-failing guide. Although a minister in these days is not one on whose hands time is allowed to hang heavily, at the period referred to clerical work was even more onerous, the religious wants of the simple-minded people being much more numerous, and Father Fröbel, moreover, being too earnest and too conscientious a man to perform his duties carelessly.

Besides these very extensive engagements, he had at that time to superintend the building of a church, which had been planned on a scale far beyond the requirements of the village. Can we wonder, then, that he had but little spare time to devote to the special care of his own family?

In the evening of April 21st, 1782, he wrote in his large family Bible: 'This day the Lord has given me a third son; Friedrich shall he be named, for peace (*friede*) be with him.'

If that benediction has ever been verified by the subsequent seventy years of that son's eventful life, it

must be viewed in a higher and sublimer light than matters of this earth can bear; indeed, in a mere worldly sense, peace would seem to have been a quality unrecognised in his existence. To be deprived of his mother was his first great misfortune. At the fall of his first year, the 'angel of his childhood' was recalled to her heavenly home. Bereft of their mother's loving care, the children were now in a most pitiable condition. No mother, alas! and their father, overworked with stern duties, all but lost to them! Little Friedrich was nominally committted to the care of the servants; but these, taking a mean advantage of their master's habitual absence, left the child to himself; and he would have been in a pitiable plight indeed had not his brothers tried their best to supply a mother's care. Whatever happens to a young child is sure to leave a deep and lasting impression. To this early desolation Fröbel ascribes that deep-rooted affection for his brothers, and that passionate family feeling, which had such a magic influence on him in all his after life.

So conscientious a man as Johann Fröbel—who laboured to the last of his strength for the good of others—a 'father' so devoted to the thousands confided to his care—could not fail to see such serious defects in his household. He saw the only remedy for the rebuilding of his broken home, and accordingly, in 1786, he gave it a new mistress. Friedrich welcomed her with all that fervent love, that open-hearted confidence which his little heart had so long been yearning to bestow. That outpour of long pent-up affection warmed, developed, strengthened his whole being. It was kindly received, and for the first time in his life he enjoyed a pure happiness. Alas! too short was the dream! With the entrance of her own first-born all affection was concentrated on the new idol. There was no room apparently in her heart for any other child-love, and gradually her feelings deepened from indifference to positive dislike. When this dislike so manifested itself as to change the familiar, homely 'thou' (*du*) to the cold, distant 'he' (*er*), the poor boy's heart sank within him, and the bitter anguish of hopeless alienation filled his soul. Nevertheless, he would not allow the least feeling of disrespectful irritation to enter his heart. In vain did low-minded people try, as he grew up, to poison his mind against his mother; with horror he shrank from them and their suggestions. All these sad experiences, however, roused his moral sense. The more he felt himself repulsed by those whom he yearned to love, the more did he seek refuge within himself, and his firm resolve to keep his 'inner world' pure and noble, and, come what may, to make sure of deserving that love which was so cruelly denied to him, became wonderfully strengthened. Indeed, the high moral standard, the noble self-respect which made his life so pure, and so blameless, doubtless had its foundation in these early experiences.

A stern theologian of the rough-hewn old school was Father Fröbel. He thought comparatively little of science and literature, but attached great importance to faith. He endeavoured, nevertheless, to keep pace with the progress of the age. He took in the best periodicals of the time, and would examine their contents with deep interest. Stern and rigid, like himself and like his religious views, were the devotional exercises in his own home. In the morning and evening the whole household assembled for prayers and devotion, and the sermons and meditations of such famous divines as Jollikofer, Sturm, Hermes, and others were read and discussed. The out-door exercises of the children were sadly limited: no trespassing beyond the narrow limits of the parsonage was allowed. To transgress this rule would have led to the temporary loss of their boots. But so much the more did Friedrich cling to every tree, plant, stone—nay, to every foot of ground. Nature engrossed all his thoughts, all his energies. Chips of wood from the carpenter's workshop were to him priceless materials for play, and the very paucity of his playthings compelled him to make the most of those he had, and to learn as far as he could their properties. In after life he used to say that he owed the principal features of his Kindergarten to these early days of his childhood, and that he considered his views of child-education the outcome of his own experiences in the dawn of his eventful life.

But life at the parsonage was not altogether so dull and so monotonous as might be supposed from the foregoing remarks. Both his parents took great delight in cultivating their garden and grounds. It was the good pastor's pride to outdo all his parishioners in the excellence and variety of his vegetables and flowers. Nor did he forget the house itself. Order and neatness prevailed everywhere. Johann Fröbel and his wife were always at great pains to improve, and embellish; to blend the beautiful with the useful was their constant aim. That was one bright ray of sunshine indeed for poor little Friedrich. His whole soul was in the work: everywhere he was eager to assist, and many were the developing impressions which he received from these occupations. To these, alas! may be traced, perhaps, the sad misjudgment he made as to his true calling in life, which we shall presently have to record. However, all these circumstances were over-ruled to serve a great purpose, as was also another peculiar experience in his home life. As a true and conscientious shepherd to his numerous flock, Father Fröbel was daily called upon to afford spiritual assistance. He entered into the troubles and doubts of every applicant with deep sympathy, sternly rebuking, counselling, or consoling, as occasion seemed to demand. Of this pastoral labour young Friedrich was generally a silent witness, and never without receiving deep and lasting impressions. He thus early learnt to study the miseries of human life and to contemplate the 'inner world' of man. His own heart's troubles caused him to turn his inner eye upon himself as well as upon the inward condition of others.

With regard to this early period of his life, he says: 'Unremitting self-observation, self-study, and self-education has been the fundamental character of my life from my earliest days, and has always continued to be so. To rouse and to strengthen energy, and to instil in others an earnest resolve to labour continually in their own education, is and always has been the first law of my educational labours; and all my educational plans, proposals, and means are directed to this end, by which alone a man can manifest his real manhood.' And again, in another place of his autobiography, he says, alluding to the above-mentioned influences: 'Thus nature, industry, and religious exercises combined to cultivate, to elevate, to edify the young mind. The natural result of all this was, the firm resolve to seek and to walk the way to eternal life, to become a child of God, and to devote all my life to the benefit of my fellow-men.'

And was he then, after all, such a model child as his genius would bid him to be? No one will expect that; he was a child, though thoughtful and reflective far beyond his years, yet often impetuous, boisterous, reckless, liable to excesses in his impulsive nature, and consequently always in some scrape or other. In the exuberance of his spirits, he often destroyed thoughtlessly what he wished to examine and to study, and thus of course afforded his mother with plenty of reasons to confirm her bad opinion of him.

His elder brothers had both been instructed in the three R's by their father; but encountering much difficulty with Friedrich in teaching him to read, Father Fröbel lost his patience, and resolved to send this son to the public school.

So accordingly he was sent; but not, however, to the boys' school, as one would have supposed. His father did not think much of the discipline of that school, so he was sent to the girls' class, which was remarkable for order, quietness, and good behaviour, and Friedich's peculiar temper seemed to require the gentle and soothing influence of girls. But this only estranged the lad more and more from a child's natural sphere of life; he felt himself isolated, a stranger amidst the boys, a stranger amidst the girls, a stranger at home, everywhere solitary and little understood, save by his dear beloved brothers.

(*To be continued.*)

Physiology.

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CHAPTER IV.—(*continued*).

The *vertebral column*, or *spine*, or *backbone*, as it is also called, is composed of twenty-four bones, called *vertebræ*, resting on and fixed to one another; or, reckoning the sacrum and coccyx, twenty-six. These bones vary considerably in appearance at different parts, but they agree in certain common characters. Each one possesses a large mass in front called the body, and from this an arch springs behind, enclosing a central cavity. At definite points on the arch are projections which correspond with similar projections on neighbouring vertebræ, and serve for articulating the different vertebræ together. Behind a spinous process projects. All the different forms of vertebræ may be examined in a rabbit after it has been cooked, and the flesh is separated from the spine.

The bodies of the different vertebræ rest on one another, being only separated by flat discs composed of fibro-cartilage. These discs prevent the hard bones striking against each other, as when we jump from a height, and lessen the force of any shock that would otherwise be received by the spinal cord and brain. They form about one fourth of the whole height of the vertebral column.

The arches of the vertebræ in a similar way lay over one another, and thus a canal is formed in which the spinal cord is protected. The arches are united together by ligaments of elastic tissue, which allow a certain amount of movement, as in bending forward.

In the cervical (neck) region there are seven vertebræ: in the dorsal (back) there are twelve; and in the lumbar (loins) five; while the lowest of the lumbar vertebræ rests on the *sacrum*, a wedge-shaped bone, composed really of five vertebræ fused together; and this joins on to the *coccyx* below, which is formed of four fused vertebræ.

Fig. 12.—Dorsal Vertebra, seen from above.

The two highest vertebræ are peculiarly modified, so as to allow free movements of the head from side to side. The first vertebra, called the *atlas*, because it supports the head, like Atlas of ancient story was supposed to support the world, has no body, while the second vertebra, or *axis*, has, in addition to a body, a projection upwards, which acts as a pivot. A strong

Fig. 13.—Lateral view of the Spine.

ligament runs from each side of the atlas round this projection, fastening the two bones together without fixing them, and then the atlas bearing the head rotates round this pivot.

A rib is attached to each side of the bodies of the dorsal vertebræ, twenty-four ribs attached to the twelve vertebræ. These ribs arch forwards and enclose the cavity of the *thorax* or chest. The upper seven ribs are called *true ribs*, and they run forwards to join the breast-bone or *sternum*, which runs down the centre of the chest in front. The ribs do not join this directly, but the two are connected by pieces of cartilage shaped like ribs, called *costal cartilages* (costa, Latin, a rib). (See Fig. 4.)

The lower five ribs do not join with the sternum in front and are called *false ribs*.

Three of them are attached to the costal cartilages, while the lowest two are unattached in front, and are called *floating ribs*.

On looking at the spine as a whole, we see that it is not a straight column, but presents four curves, two with the concavity forwards and two with the convexity forwards.

This ensures a greater elasticity and spring to the spine, and, with the intervertebral discs, prevents concussion of the spinal cord or brain from any sudden fall or blow.

The skull is supported on the top of the vertebral column, the atlas and occipital bone articulating together. A large hole in the occipital bone communicates with the spinal canal, and through this the brain and spinal cord become continuous.

The skull is divided into two parts—the *cranium*, containing the brain, and the *face*. The cranium consists of eight bones, closely united to each other in the adult, but separate in the infant. Even in the adult, the lines of union of the bones are visible in the form of *sutures*. The edges of the bones are often serrated, like the edge of a saw, the serrations of adjoining bones exactly fitting into each other. Other bones have their over-lapping edges, as at the junction of the temporal and parietal bones.

The eight cranial bones are the *occipital* situated behind, the two *parietal* bones laterally, the *frontal* bone forming the forehead, the two *temporal* bones in the region of the ears, and the sphenoid and ethmoid completing the base of the skull.

Fig. 14.—The Skull.

The face is made up of fourteen bones two nasal, two superior maxillary (upper jaw), two lachrymal, two malar ('the cheek bones'), two palate, two inferior turbinated, vomer, and inferior maxillary (lower jaw). All these bones form one continuous mass, without the intervention of a movable joint, except the lower jaw, which is freely movable.

The arm is fastened to the upper part of the thorax by muscles and by the collar-bone. The collar-bone (clavicle) and shoulder-blade (scapula) are really part of the arm; and although the scapula lies over the ribs it does not form a joint with them.

The *clavicle* articulates at its inner end with the sternum, to which it is bound by very strong ligaments. At its outer end it articulates with a projecting part of the scapula, called the *acromion* process. The scapula

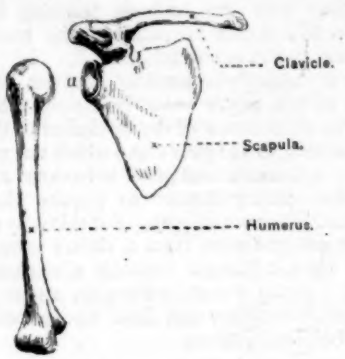

Fig. 15.—Right Clavicle, Scapula, and Humerus.

is a flat triangular bone, laying on the ribs from the second to the seventh, and presenting certain processes. On its outer edge is a pear-shaped cavity, called the *glenoid cavity* (*a*, Fig. 16). This cavity is very shallow in the skeleton, but in the natural condition is deepened by a rim of cartilage. The head of the *humerus* fits into the glenoid cavity, and the shoulder-joint formed by the junction of these two bones allows free movement of the arm in all directions.

Fig. 16.—Right Scapula seen from behind.

The lower expanded end of the humerus articulates with the *ulna*, the upper end of which is expanded into a hooked process, the *olecranon* process, which, articulating with the humerus, does not allow movement from side to side, but only bending and straightening the arm, or, as it is called, flexion and extension.

On the outer, that is the thumb side of the ulna, is the radius, the upper and lower ends of which articulate

Fig. 17.—Radius and Ulna.

Fig. 18.—The Right Hand.

with the outer side of the ulna. The ulna remains fixed, while the radius carrying the hand with it rotates from side to side. When the radius is turned over the ulna, so that the back of the hand points upwards, the position is called *pronation;* when the palm of the hand is uppermost the position is *supination.* The lower end of the radius articulates with the upper part of the *carpus*, which is formed by eight small bones, arranged in two rows. The upper row consists of the scaphoid, semilunar, cuneiform, and pisiform bones; the lower, of the trapezium, trapezoid, os magnum, and unciform. These eight bones are joined below by five *metacarpal bones*, and each metacarpal bone has attached to it three *phalanges*, except the thumb, which has only two phalanges. The joint formed by the metacarpal bone of the thumb with the trapezium allows movement to occur, so that the thumb can be opposed to any of the other fingers. The mechanism of the movements of the hand is very beautiful, and well worthy of study. The most delicate movements can be performed by it, as in writing. The presence of the eight carpal bones allowing some degree of gliding movement over each, not only gives greater flexibility to the hand, but the force of any shock received is broken in passing from one bone to another, and so injuries are much less likely to occur. The fact that the hand articulates with the freely movable radius and not with the ulna, which can only be flexed and extended, gives much greater play to its movements.

(To be continued.)

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Lessons in English.

BY ALEXANDER BAIN, LL.D.,

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XI.—Emotional Qualities of Style.

One grand source of the agreeable interest of Poetry is the exhibition of human character. In Homer, this had already attained a high degree of development; and succeeding ages have added to it without limit.

It is, of course, the natural interest of human beings in each other, as shown in actual life, that forms the groundwork of this artistic effect. The special affections and emotions of our nature are personal; and to treat of the interest of persons is merely another way of considering the interest of the social emotions, whether of amity or of enmity. Our primary interest is in the persons of our own circle, with whom we have intimate relationship—as in the family, and in the immediate surroundings of our social life. We can go beyond this, and can come under the attraction of chance individuals, by virtue of the qualities we discover in them; as from their being agreeable in person, in demeanour, in conduct, or otherwise. Beauty even in a stranger may arrest our regards; elegance of speech or deportment, stores of accumulated knowledge, the moral qualities of energy, endurance, amiability,—afford satisfaction to every beholder. So marked and powerful are the feelings thus awakened, that those who cater for our pleasures, look out for subjects possessing such attributes, and bring them vividly before us. The theatre affords one effective mode of displaying personalities of more than common interest. Nothing is gained by merely repeating the displays of excellence that we have constantly about us in our own circle: some of the rarer kinds, or of the more distinguishing degrees, of the choice qualities, have to be presented for our admiration.

It is possible to give a tolerably exhaustive enumeration of all the phases of human beings that excite an agreeable feeling in beholders. In a work entitled *Sensation and Intuition*, Mr. James Sully has been very successful in such an attempt. He has considered, first, the Æsthetic Aspects of Character, as actually witnessed (or as described with the literality of the historian), and, next, the Representation of Character in Art, under which is included the selection and handling of Character in Poetry. To be thorough, an examination of the subject as wide as Mr. Sully's would be needful for a theory of literary criticism. A narrower view, however, may serve the purpose of a useful lesson in English Literature.

We must recall the observation made, in a previous Lesson (IX.), on the extract from Milton, namely, that we may take very great pleasure in a striking aspect of personality, without complete realization of the person as a whole. But for this circumstance, the great epic poems from Homer downwards, would be thrown away upon us. It is very little that we can conceive of the full personality of Achilles, Agamemnon, Ulysses, Ajax, Helen, Andromache, and Penelope; yet all these have been so set forth in Homer as to give them an imperishable charm. The defect in our means of realizing their full individuality, is made up by the art of the poet. The peculiarities of this artistic power—the theory of its success or failure—constitute the problem of literary criticism as regards the handling of character.

There are two ways of setting out character with a view to poetic charm. The one is short and summary, consisting in the use of descriptive epithets, which convey the attributes that give us satisfaction. The other is more detailed: it shows us the character in action, from which we gather a still more lively impression of the qualities displayed. Both methods are used in poetic composition: both may be managed artistically, and with effect; and both may turn out failures.

The Prologue of the Canterbury Tales is still one of our finest galleries of portraits wrought by descriptive touches. Both the physical and the mental peculiarities of the different personages are pencilled by strictly poetical devices. I will take for illustration and criticism the Clerk or Scholar.

Before descanting on the high poetical excellence of this portrait of character, some remarks may be made on its more formal peculiarities.

The features selected by the poet are chiefly these: (1) the poverty and low physical condition of the clerk; (2) the voluntary self-denial under the overmastering passion for study; (3) the noble and scholarly bearing as shown in his conversation.

The poet presents these three features in succession, as undoubtedly ought to be done: poetical handling does not dispense with such a methodical arrangement of topics as forms a help to the understanding. Now, a minute criticism discloses a few dislocations, which put in a stronger light the general adherence to the plan. Certainly, in any personal description containing at once physical and mental traits, the physical should come first, and be completely set forth before entering on the mental. Of these last, the intellectual usually precede the moral, but there may be good reasons for the invertion of that order. In the present example, lines 3, 4, 5, 6 are devoted to the bodily appearance of the scholar: the poet curiously begins with the horse, which he poetizes by one of his happy and expressive similitudes. He passes next to the rider, who is depicted by selected circumstances all expressive of poverty and an inferior condition physically.

The second feature—the passion for study—is expanded through thirteen lines,—7 to 19. We must, however, revert to line 2, as belonging also to the same part.

That unto logike haddè long ygo.

This would be objectionable in placing, but for the commendable wish of the poet to begin with a comprehensive epithet that sets forth the man at a stroke. It is open to the hyper-critical objection, that "logic" is not an all-embracing name, even according to the state of knowledge at the time, and is inconsistent with what follows—the twenty books of Aristotle and his philosophy. In fact, the really comprehensive word would have been, not logic, but "Aristotle."

As to the management of the consecutive description from 7 to 19, we remark, first, the explanation of the scholar's poverty in 7 and 8; namely, his having no benefice, for want of worldly pushing: these two lines might be inverted—the unworldliness coming first, as the cause, and the want of office second, as the effect. The next line, 9, begins the graphic description of his small library, showing his studious taste, as against the taste for dress, or for music. The name of "philosophy," however, leads to a repetition of his poverty, being a sort of dislocation: it is accounted for by the irresistible transition in Chaucer's mind from philosophy to alchemy, which was the search for the philosopher's stone. One digression, or dislocation, usually leads to another; and we have the repetition of the taste for books in connection with the scholar's dependence on his friends for the supply of his wants; his gratitude consisting in prayers on their behalf. Line 19 is iteration carried to superfluity, and not redeemed by any poetic art—

Of studie took he mostè care and hede.

The concluding five lines are the gem of the description. The first—

Not a word spake he more than was nede—

is very high praise felicitously summed up in a metrical utterance.

The two next lines expand the thought with additions—

All that he spake it was of heye prudence,
And short and quike, and full of gret sentence.

The scholar is supposed to be a man well versed in the maxims of prudence handed down from former ages, and at the same time able to express them in terse and dignified phraseology. This is the true ideal of scholarly attainments. It is carried out in the next line—

Sownynge in moral manere was his speche—

indicating moral tone as well as prudential wisdom. The concluding line is the poet's crowning effect—

And gladly wolde he lerne, and gladly teche.

This hits off the love of knowledge in its noblest form: readiness to imbibe from any master or any source, and equal readiness to impart. There is a usual type of scholarship, combining great reluctance to derive anything from others, and the fondness for imparting only what will bring the credit of originality. Chaucer's ideal is very different. The composition of the line is also notable. No doubt the phrase "gladly wolde he lerne" repeats what we have been told already, but the summary is so felicitous that we would not willingly dispense with it. In a prose description, cast in the strictest scientific order, the qualities set forth in these five lines, as well as in other parts of the passage, would be disentangled and given in separation; which no doubt would be an improvement as respects our understanding of the character. The poet is not bound by the same strictness: nevertheless, an arrangement of ideas suited to the clear understanding of the thought is not inconsistent with poetical treatment: it merely involves intelligence and pains at the outset. If an equal amount of adornment can be imparted to the more methodical arrangement, the reader finds it easier both to comprehend and to remember the entire composition.

The charm of the above passage, as a whole, may be accounted for on the general principles that regulate our interest in character, as poetically rendered. A bald prose description of the excellences attaching to the subject would be highly agreeable: the poetic handling superadds an additional charm; and the combination makes up one of the perennial felicities of literary art.

Innumerable examples of character struck off on the descriptive plan are scattered through the field of poetry ancient and modern. We have portraits, like the foregoing, intended to raise our admiration, and give us the pleasure thence accruing. We have others that are meant to cause indignation, dislike, contempt or ridicule; giving scope to the still greater piquancy of the malevolent passion. From the extreme complexity of human nature, the same person may raise in us various emotions—as Bacon. The personal satires of Dryden and of Pope are conducted by descriptive touches, and might be judged on the same plan as we have pursued with Chaucer; the epigram-

matic pungency being, however, more prominent than the other merits.

Among the many human peculiarities that please us, in the actual encounter, is to be reckoned moral excellence, in the form of self-renunciation. The egotist repels us; the man of unselfish impulses is viewed with satisfaction. He that gives up the common objects of pursuit for a higher ambition is an interesting character: being agreeably contrasted with the mass of human beings, who keep up the rivalry that makes existence difficult to all.

Again, intellectual acquirements and excellence that either supply guidance in the dark ways of life, or prepare for the displays of eloquence, call forth our complaisant admiration. This too is exemplified in Chaucer's Scholar. If we meet such a man in real life, we feel ourselves drawn to him.

The peculiarities in question must, I repeat, be of rare and exceptional amount. Qualities that nearly everybody about us possesses may command a certain esteem from their worth, but they do not inspire us with lofty admiration.

The other mode of representing Character is by sustained action. This involves the narrative of incidents as in history: so that poetry, when adopting this course, bears a resemblance to history, as we see in Homer and the epic poets generally, and also in our modern romance. The dramatic form is a special variety of the same kind of composition. When character is set forth in this mode, it falls under certain qualities or conditions of style, easy to state, but not so easy to apply in the detail: as, for example, Probability, Self-coherence, and Harmony with accompaniments and surroundings.

It belongs to the higher criticism of entire poems to say how far such conditions are imperative, and how far they are actually complied with in regard to any given work. The disputes as to Shakespeare's intentions in Hamlet, Macbeth, and Lady Macbeth, as well as to the Faust of Goethe, seem to show that character criticism is apt to be uncertain and precarious, and, therefore, scarcely a subject for elementary lessons in the qualities of style. The difficulty is not the same with individual actions capable of being viewed in isolation. These we can value on their own account, without being involved in the estimate of character as a whole: while such minute criticism is, as in the case of style generally, the best preparation for the larger surveys that the ordinary critic most delights in.

The descriptive mode of handling character is often relieved by the short recital of actions by way of example or illustration. Thus the Clerk is represented as grateful to his friends who assisted him with the means of studying, and the gratitude is rendered in the act of praying for their souls. Milton's Mammon is set forth by descriptive touches, interspersed with illustrative actions:—

> Mammon led them on—
> Mammon, the least-erected spirit that fell
> From heaven; for even in heaven his looks and thoughts
> Were always downward bent, admiring more
> The riches of heaven's pavement, trodden gold,
> Than aught, divine or holy, else enjoyed
> In vision beatific. By him first
> Men also, and by his suggestion taught,
> Ransacked the centre, and with impious hands
> Rifled the bowels of their mother earth
> For treasures, better hid.

In this passage the expression is sufficient to render it poetical. The character interest, apart from the expression, is due not to our admiration or liking for the quality of avariciousness, for that we must take pleasure only in despising, but to the place found for it in the general action of the poem; which is to rouse the interest attaching to the rebellion of Satan and his host. Mammon is introduced as the constructor of the mighty palace erected in obedience to Satan's orders. It pleases Milton to connect the love of riches with skill in architecture, although the two things have no necessary connection, nor obvious harmony. For the demon of avarice a still more appropriate occupation might have been found; as, in inspiring men with the love of money in all forms, and so drawing them on to the vices that follow in its train.

Whether Milton did well to tarnish the lustre of the unfallen angels by representing one of them as already given over to a sordid propensity, is a question that may be put for the sake of stimulating critical inquiry; yet it hardly admits of an answer. In the region of the supernatural, great latitude is allowed and taken; and we must judge solely by the artistic results. The Greek gods were permitted to exemplify all the round of vices, and the poets took advantage of their failings in using these for poetic purposes. Milton had to deal with the one mighty contrast of Heaven and Hell, and must have felt himself under restraint in varying the individualities of the members of the opposing hosts. He could not deviate much from the contrasting moral types: the one class must possess an almost even goodness, the other an equally even badness; the chief admissible variety being intellectual, shown in the differences of view as brought out in the debates of the leaders.

This lesson will close with a few more illustrations of its main theme—the portraying of character by descriptive epithets. Homer found scope for his genius in poetizing the characteristics of his heroes: his epithets are a part of his originality, and have set subsequent poets to work in the same line. His principal mode of describing character is by action, under which is included speech-making: but in introducing, or in referring to, the chief personages (gods as well as men) he generally names them with a characteristic epithet. Agamemnon—king of men, shepherd of the host, wide-ruling; Achilles—fleet of foot, noble, god-like; Odysseus—heaven-born, many-counselling, full of devices, steadfast, goodly; Hector—of the glancing helm, rash, noble; Diomedes—of the loud war-cry, stalwart; Tydeides—great-hearted; Ajax—Telamonian, heaven-descended; Helen — beauteous-haired, long-robed, fair among women; Aphrodite—bright, laughter-loving; Athene —bright-eyed goddess; Here—the white-armed goddess, the ox-eyed queen; Zeus—father, far-seeing, ægis-bearing, cloud-gatherer, earth-shaker; Iris—golden-winged; etc. The practice of coining epithets goes beyond persons, and is extensively employed both upon animals and upon inanimate things; these epithets are a large part of the poetry of all times, and their effect is a topic for critical discrimination.

Adhering to the subject of character epithets, and taking the Homeric examples as a study, we may easily divide them into several different kinds. Some are probably customary and prosaic, as noble, stalwart, rash: of this we cannot judge, as we know nothing of

the every-day speech of the Greeks of Homer's time. The more strictly poetic epithets are partly elevating similitudes—as 'god-like,' 'shepherd of the host,' 'king of men' (in some degree literal), 'heaven-descended;' and, still more frequently, selected circumstances, qualities, or adjuncts, interesting in themselves, and poetized by some elevating or picturesque phrase—fleet of foot, with the glancing helm, beauteous-haired, long-robed, bright-eyed, white-armed, the cloud-gatherer, etc. An elevating, expressive, or suggestive metaphor or other similitude is at all times a stroke of poetry. Equally poetical is a well-chosen circumstantial among the various attributes of the object: the white-armed, the bright-eyed, the long-robed, the glancing helmed. The Rhetorician's synecdoches and metonymies, and other Contiguities, partly square with this large class of perennial effects. They have their rules of propriety growing out of the occasions of their employment. Their poetic excellences are picturesqueness and elevation, to which last end they must be removed from common-place. Their additional virtue lies in bodying forth, and in not obscuring, the point of character intended by them. In this respect, only a partial success is achieved by the greatest poets. In physical characteristics more especially, the power of poetry is very limited. Homer does nothing to assist us in picturing the real features of Helen; he works solely by the method of suggestive effects. So do poets for the most part, and the result is usually extreme vagueness in the picture, with frequent emotional straining. Here is a personal description from Tennyson's Helen, in 'Fair Women:'—

> At length I saw a lady within call,
> Stiller than *chiselled marble*, standing there;
> A daughter of the gods, *divinely tall*,
> And most divinely *fair*.

To this add—

> The star-like sorrows of immortal eyes—

and we exhaust the aids given to our conception of the personal features.

Take next the poet's picture of Cleopatra—

> A queen, with swarthy cheeks and bold black eyes,
> Brow-bound with burning gold.

This is all that relates to her appearance. A fine stanza is devoted to her voice and utterance:—

> Her warbling voice, a lyre of widest range,
> Struck by all passion, did fall down and glance
> From tone to tone, and glided thro' all change
> Of liveliest utterance.

The eyes are again brought before us, in their expressive movements:—

> She raised her piercing orbs, and fill'd with light
> The interval of sound.

These instances of very slender descriptiveness will prepare us to revert to Chaucer, in concluding our Lesson. The example of the Clerk is not the best for the present purpose; the personal touches are there but few. Take, however, the complete, not to say elaborate, description of the Miller, which leaves almost nothing to be desired in point of minuteness, while the touches are expressive and original, with an admirable effect of humour throughout. There is Chaucer's usual neglect of order; there are illustrative actions thrown in, but not dwelt upon, as his power of wrestling and unhinging a door with a blow of his head. The general setting is given, at the outset, in the phrase a 'stout carle;' next, he is big of braun, and of bones, to which correspond his displays of might; his beard red as sow or fox, and broad as a spade; on the top of his nose a wart with bristles; his nose thick, black and wide: his sword and buckler come between this and the powerful closing line—

> His mouth as wide was as a gret forneys.

This is an example of Chaucer's rude, coarse characters; but we need only turn to the Prioress to see nearly the same fulness in the perfection of refinement. The description, as a whole, is more than ordinarily disarranged; but the personal touches are exquisite and effective:—

> Her nose tretis (straight); hire eyen grey as glass;
> Hire mouth ful smale, and thereto soft and red;
> But sikerly she had a fayre forhead.
> It was almost a spanne brode, I trowe.

The other parts of the Nun's character relate to the very beautiful *morale*, and are more fully supported by illustrative actions than in most of the other personages of the Prologue.

(To be continued.)

Swiss Education.

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(Continued from page 231.)

(*c*) *Infant Schools.*—While so much interest is taken in the supplementary schools, the preparatory infant-schools are nearly everywhere neglected. Indeed, the school age commences so late as to exclude this class of schools from official recognition altogether. There are, however, infant-schools in most cantons, established and maintained either by private enterprise or by the commune. Only in French Switzerland, however, has any attempt been made to organize them into a general system introductory to the primary schools. In these cantons the infants are taught the elements of reading, writing, and counting, but in the remaining parts of Switzerland no such instruction is given in infant-schools, even where they happen to exist. The total number of such schools only amounts to 355, in which about 17,000 children are taught by 400 teachers, who are, of course, mistresses.

Before leaving this division of the report, I must briefly refer to one more class of schools, viz.:—

(*d*) *Industrial Schools for girls.*—The Swiss schools being generally mixed, it is necessary to provide separately for the teaching of sewing, etc., to girls. This is done in special schools or classes provided for the purpose. In four of the cantons, however, no such provision is made, and in two others, viz., Zug and Neuchatel, only a commencement has recently been made. In the remaining cantons the schools seem to be tolerably well organized, although all the teaching is at present individual, and class instruction is unknown. The difficulties which at present beset the undertaking are lack of efficient teachers, the want of suitable buildings (the school-rooms being regarded as most unsuitable), and the difficulty of procuring materials for the poorer children.

The number of schools already established is 3185, under the care of 2286 teachers, attended by 101,710 pupils. The attendance generally commences with the third school year (the child being at least nine years old), and includes from two to six hours a week. The subjects taught are knitting, sewing, mending (including patching and darning), and cutting-out. The mistresses as a rule are ill paid, and in several of the cantons they are inefficient. The consequence of this is that discipline is ineffectively maintained, the work is carelessly done, and the teachers are often changing. But this is in a fair way of being remedied. The district committees are organising courses of instruction for the training of mistresses, suitable rooms are being opened in the various parishes, parents and committees are everywhere waking up to the importance of the subject, and finally, female inspectors are being appointed to visit the schools and direct the teachers. Undoubtedly, great activity is being manifested in this department; but there must be a considerable proportion of girls whose industrial training is altogether neglected, and I do not see any reason to believe that the teaching of the rest is anything like so effectively done as in the English schools.

IV.—SCHOOL PREMISES.

The last subject to which I shall refer is school buildings and apparatus; and it may be stated at the outset that these are both of very modest pretensions. In many districts the necessity for the erection of suitable buildings, and for the supply of school furniture, is not fully recognised, and although considerable progress has been made in this department during the last few years, considerable time must elapse before the growing demands of the population, and the requirements of modern methods of education can be fully or even fairly met. Many of the buildings are confessedly too small, and many which are reported as satisfactory, are barely adequate in structure or apparatus to meet the moderate requirements of the law. Where the schools are too small, the upper classes are taught in the morning, and the lower in the afternoon. In the canton of Schwyz, nine school premises are reported as unsatisfactory, out of a total of 126. A few places in St. Gallen have no school buildings whatever. In the Grisons, many parishes possess wholly insufficient premises, and in Aargau, thirty out of 283 are reported as unsatisfactory. The inspector in Basel-land condemns sixteen schools as being too small, too dark, too low, or otherwise unsuitable. In Wallis, things appear to be even worse. On the other hand, the school buildings in the towns are often very complete, and even palatial in their structure. In Basel, £10,200 have been expended on a single school. This is the most costly undertaking mentioned in the report, although Mr. Mundella, in his Birmingham speech, referred to a school in Luzern which had just been built and fitted up at a cost of £20,000. A second school in Basel cost £2960, towards which the State contributed £1400. But these instances are entirely exceptional; and the standard indicated by them must not be applied to the country as a whole, nor even to all the towns.

It is satisfactory to find, however, that the local departments are encouraging the committees to build better schools by offering more liberal grants in aid; and as these are only paid where the plans have received the approval of the department, the new buildings which are springing up are greatly in advance of the old in elegance, completeness, and adaptation. There is, however, no recognised type of school building which has received general approval; and the question as to the best plan and elevation, the proper method of lighting, warming, and ventilating, and the most suitable furniture and fittings are all awaiting solution, so that there is no approved standard in these particulars, either in Switzerland as a whole, or in any of the cantons. This is sufficient to show that in this, as in the other particulars already discussed, very erroneous ideas as to the completeness of the Swiss schools have been promulgated by those who have taken their notions on the subject from a few favoured localities, often a single township, without stopping to inquire how far these were applicable to the country as a whole. As in other matters, so in regard to school premises, we are not, as a nation, behind the Swiss, but much in advance of them, and in a little time we shall have left them far behind.

Here I take my leave of Herr Grob, with the hope that this attempt on his part to furnish a report of Swiss education, will lead to such uniformity and method in the compilation of the cantonal reports as will furnish the materials for a more exact and complete view of the subject in future. Meantime, the best thanks of both Switzers and foreigners are due to him for having cleared the ground by pointing out existing deficiencies, and for the patience and ability with which he has combined his imperfect materials so as to present, at least in outline, a summary view of Swiss primary education. To his own countrymen the advantages of such a work are too obvious and numerous to require special mention, while to foreigners it supplies information valuable in itself, but otherwise inaccessible. I trust the task so ably performed, which must have been both laborious and difficult, will not be without its beneficial effects on Swiss education, nor without instruction for other countries.

It only remains to indicate some of the lessons to be drawn from this hasty review. And the very first is surely a lesson of patience and caution. A general and complete system of national education, perfect in all its parts, and suitably adapted to the varying conditions and needs of national life, cannot be developed in one generation, even in such a small country and under such simple and uniform conditions of social life as exist in Switzerland. It may be pleaded, indeed, that such a report as that from which this sketch of primary education has been drawn, was written for the express purpose of pointing out defects and indicating weaknesses, and that our attention has been drawn too exclusively to the shady side of the system. This may be so; but, in any case, the report is valid evidence that such imperfections still exist, and that they are neither confined to one department of the system nor limited to a single geographical district. And if in Switzerland, with its numerous education departments, each of which is a centre of active influence, with a free and compulsory system which has been long in operation, and with a population which everywhere sets a high value on education; if, with these and other advantages, it is still found that the perfect-

ing of school methods and the providing of buildings and apparatus suitable for their execution and development is a work of time, we may well be content with the progress we have made in these particulars during the last few years. The truth is, that in a free country the work of education cannot be pressed forward at a greater rate, or beyond the limits approved by the great mass of the people. Education must always, therefore, begin by making good its claims upon the adult population before a much higher standard can be enforced upon the children. When these and other difficulties, which are sufficiently obvious (I refer especially to the claims of labour and the repugnance to constraint), are taken into account, it will be seen that we are proceeding as fast as it is practicable under the circumstances, and we ought not therefore to be dissatisfied either with the progress already made or with the plans already adopted, even though depreciatory critics are ever ready to assure us that in the matter of education we are far behind most of the other countries of Europe.

Further, when we look at the results already attained, and compare them with the corresponding results of the Swiss primary system, we have no reason for discouragement. The one point, and the only point in which we are signally behind, is in the character of the attendance. This superiority on the part of Switzerland does not arise so much from the stringency with which the compulsory law is enforced, for we have seen that it is often very laxly administered, as from the higher estimate put upon the value of education by the people. It is true, this does not reach to the very lowest stratum, even in Switzerland, but it is much more widely diffused than in this country. But here, again, we require time and a people who have themselves been educated and are willing to submit to some self-denial that their children may enjoy the same advantages as themselves. This work cannot be greatly accelerated by Acts of Parliament, or even by School Boards. At least, they cannot of themselves perform the work. It must grow as the general outcome and product of national education in the widest sense.

But in regard to the education of the children who actually attend our schools, we are clearly not one whit behind even this favoured country of Switzerland. The schools are as well adapted for their purpose, the apparatus and furniture are more complete, the teaching is as thorough, the inspection is much more complete and searching than in the best class of schools in the best cantons. And, even in regard to average attendance, it ought not to be forgotten that the hours here are much longer than in Switzerland, and that the schools are always open all the year round; so that English children who do attend school are quite as well and successfully taught, and leave the schools better prepared for the work of life than the Swiss children. In truth, the Swiss education reminds one very strongly of George Eliot's clergyman, who was superlative in nothing except that he was superlatively middling.

At the same time, it would be ungenerous and unjust to withhold our admiration for the enlightened zeal and self-denial with which this prudent and courageous people have striven, under many difficulties, and have striven successfully, to establish a popular and universal system of national education. In this great work they have set an example which might well put to shame the slack and tardy efforts of a wealthy nation like England, and which ought to provoke us to carry on this work on a scale still more worthy of our imperial position. As to methods and principles, and even educational results, we may not have so much to learn from them as is generally supposed and publicly represented, but we may still learn from them the spirit in which the work of popular education ought to be carried on, the sacrifices we should be prepared to make for it, and the high standard we should keep before us. On these points their example is both instructive and encouraging, and we shall do well to lay it to heart.

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Lessons in Latin.

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KEY TO EXERCISES.

EXERCISE 19.

A.

1. The bear crept into a tree. 2. The girls wrote the letters with their own hands. 3. The general led the army and besieged the city. 4. Seven kings reigned in the city, and then consuls had the chief power. 5. They sent letters to the senate and asked for peace. 6. The boys played in the garden, but the girls in the winter only played in the house. 7. They were driving the soldiers with their swords and darts. 8. He will have written a letter. 9. Had you not reigned before I had come to Spain? 10. Let boys love their parents.

B.

1. Mater epistolam ad filiam scripsit. 2. Angues in domum serpserunt. 3. Pueri in nive hieme luserunt. 4. Cæsar legionem ad Africam miserat, ut incolas occiderent. 5. Romulus Romanos rexit. 6. Rex epistolam ad reginam misit, ut ad Hispaniam veniret. 7. Puer sororem in pratum clam patrem duxit. 8. Epistolas cras miserimus. 9. Nemo digitum acubus læsit. 10. Veniant quia epistolas ad magistros scripserunt.

EXERCISE 20.

A.

1. The Roman matrons mourned for Brutus for a year, as for a father. 2. In the second year also again Tarquin almost took Rome. 3. Pyrrhus soon came to Italy, and then for the first time the Romans fought with an enemy from across the seas. 4. The boys were playing on the high mountain with their sisters. 5. He sent an ambassador, a good man, Cicero by name, so that Pyrrhus might obtain a part of Italy. 6. Horace first led four lions to Rome. 7. Brutus had a good son. 8. The consul lost a great fleet by shipwreck, nevertheless he kept his army safe. 9. He also fought against the Sabines, and joined their lands to the territory of the city. 10. He showed a great garden to the boy.

B.

1. Avis suum nidum in alta arbore construxit. 2. Magnus anguis altam in fossam serpsit. 3. Puella magnas uvas carpebat ut matri daret. 4. Puellæ magistris suis manibus epistolas scribebant. 5. Ad Africam magnum exercitum misit. 6. Nonne, mi fili, ad matrem venies? Filiæ magnum leonis corpus monstrabat. 8. Timidus hœdus magnum lupum timuit. 9. Cicero ad Romam veniat ut Milonem defendat. 10. In agro magnam domum ædificabat.

EXERCISE 21.

A.

1. Pyrrhus must labour that he may preserve his life. 2. It is a great thing to labour. 3. Nobody must sin. 4. Brutus must plough that he may reap a harvest. 5. It is a little thing to surpass the Gauls. 6. It is human to love one's children. 7. Boys and girls must learn. 8. It is pleasant to labour while the sun shines. 9. We must live well that we may preserve our country. 10. It is a good thing to whip boys when they will not say their lessons.

B.

1. Militibus laborandum est ut vivant. 2. Jucundum est docere, quum pueri discere amant. 3. Ducibus ducendum est et militibus pugnandum est. 4. Magnum est fidem servare. 5. Agricolæ arandum est antea semina spargit. 6. Timidum est currere quum hostes apparent. 7. Quinque viris pugnandum est ut capitolium tenerent. 8. Militibus pugnandum est gladiis telisque ut uxores defendant. 9. Humanum est vinum bibere. 10. Per urbem currendum est, ut spectaculum videatis.

EXERCISE 22.

A.

1. I saw my image in the water. 2. I ploughed, but my son reaped the harvest. 3. We saw a high mountain in Africa. 4. I came to Gaul to see the soldiers. 5. Did we not praise the boys because they said their lessons? 6. I surpassed the Gauls in war. 7. I taught the boys and the girls and obtained praise. 8. I have sent a letter to my father that he may give a book to my sister. 9. I sent the boys with the books. 10. The sun warms the field with its heat that it may produce a harvest.

B.

1. Pueros misi ut sororem vocent. 2. Agros aravimus ut messem ferant. 3. Laborandum est quia liberos habemus. 4. Epistolam non scripsi, quum meam manum læsi. 5. Romam venimus ut linguam Latinam disceremus. 6. Ambulandum est per hortum ut in flumen manus mergamus. 7. Bonum est patriæ leges servare. 8. Puer sororem vexat ergo suam manum verberavi. 9. Dictata recitavimus, ita ludamus. 10. In fossam serpsi ut filium meum servem.

EXERCISE 23.

A.

1. It is the habit of boys to swim in the river in summer. 2. It is pleasant for boys to play in the meadows. 3. Cæsar the emperor wrote a letter to the Senate. 4. It is the part of girls to write letters for (not 'to,' as that would be 'ad' with acc., motion being implied) their mothers. 5. Brutus the consul killed with his own hand Aruns the son of the king. 6. It is the part of a king to build a large house. 7. It is a good thing to kill great snakes. 8. It is the duty of a mother to teach her daughters. 9. It is natural to man to love his children and sometimes to whip them. 10. In the first year after the city being founded Romulus invited to a spectacle of games, nations neighbouring to the City (of) Rome.

B.

1. Jucundum est agris ludere. 2. Puerorum est æstate natare. 3. Manlius, consul, ducem Hamilcarem vicit. 4. Bonum est fidem servare. 5. Romani viginti naves amiserunt. 6. Manendum est in Africa donec hostes vicimus. 7. Consul hostium quatuor naves mersit. 8. Jucundum est ad filium epistolam scribere. 9. Manlii est hostes vincere. 10. Humanum est lavare.

EXERCISE 24.

A.

1. In summer boys must swim. 2. In Africa it is pleasant to lie in the shade. 3. Hamilcar with his soldiers asked peace from the Romans. 4. Manlius laid waste Africa, and carried off many thousands of captives thence. 5. The Romans lost only four ships. 6. The priest had sprinkled the altars with flowers. 7. Let the girl bind her head with flowers. 8. I will (or let me) come to see the garden. 9. He has asked Horace that he may plough his garden. 10. He drove back the enemy with swords and darts.

B.

1. Corvus Gallum unguibus verberavit ne Horatium adspiceret. 2. Pyrrhus multas nationes gladio igneque vastavit atque ad Africam venit. 3. Per urbem ambulandum est ut spectaculum videamus. 4. Magnum est fidem servare. 5. Puellarum est matribus lanam carpere. 6. In gramine jacet et prandium edit. 7. Leonis imaginem in aqua vidi. 8. Romam veniamus ut Ciceronem oratorem videamus. 9. In prælio contra Hamilcarem quatuor naves mersit. 10. Pax non perseverabat.

EXAMINATION No. III.

1. Primo	adj. o and a	m.	s.	ab.	agree with anno.
Anno	n. o i	m.	s.	ab.	time.
Post	prep. gov. acc. case.				
Conditam	adj. o and a	f.	s.	ac.	agree with urbem.
Urbem	n. i is	f.	s.	ac.	govd. by post.
Romulus	n. o i	m.	s.	n.	subject.
Vicinos	n. o i	m.	p.	ac.	ob. of invitant.
Ad	prep. gov. acc. case.				
Spectaculum	n. o i	n.	s.	ac.	gov. by post.
Invitavit	v. a act. ind. pf. 3		s.		agree with Romulus.

2. Quām bene Satūrno vivebānt rege prīūsquam
Tēllūs pĕr lōngas ēst patefācta vĭas
Nōndūm cærulēas pinūs contĕmserat ūndas
Effusūm vēntis præbŭerātque sinum
Illo nōn validus subīit juga tempore taūrus
Nōn domito grænos ore momōrdit equus
Nōn domus ūlla forēs habŭit; nōn fixus in ăgris
Qui regerēt cērtīs finibus ărva lapis
Ipsæ mella dabānt quĕrcus, ūltroque ferebānt
Obvĭa securis ubera lăctis oves
Non acĭes, non ira fŭit, nōn bēlla; nec ēnses
Immiti sævus dūxerat ārte faber.

'Cæsaris est regnare' means, 'To reign is limited by Cæsar;' that is, it is not every one that reigns, but Cæsar who does so. So 'Cæsaris' limits 'regnare,' just as in 'Cæsaris pater cecidit' (Eng., 'Cæsar's father fell')' 'Cæsar' limits the 'father.' 'Cæsari regnandum est' means, 'Necessary reigning is for Cæsar,' or 'Cæsar must reign,' where 'Cæsar' is the indirect object of the verb. 'To' (implying motion) is omitted (as 'in') before a town or small island, probably to prevent constant repetition. The limiting genitive is the word which prevents the noun it limits from being used in a universal sense; thus, 'Cæsaris pater' implies 'Cæsar's father,' so it cannot mean everybody's father.

LESSON XXV.

LENGTH OF FINAL SYLLABLES.

190. In marking final syllables we must always be careful to remember what has been said above: that a vowel before two consonants is long, even if the consonants be in two words; so that all final syllables in consonants before a word beginning with a consonant are long.

191. If the next word begin with a vowel, final syllables ending in a consonant are as follows: those ending in 'b', 'd,' 'l,' 'n,' 'r,' 't,' are short and the others long, but if the next word begin with a consonant, final syllables ending in vowels are as follows: those ending in 'a' (except nom. and acc. cases), 'i,' 'o,' and 'u' are long, whereas those in 'e,' except abl. case and imperative of the long 'e' conjugation, are short.

192. Of words ending in 's,' of which there are very many, those in 'is' (exc. dat. and ab. pl.), 'us' (except gen. sing. and n., v., and ac. pl. of 'u' nouns) and 'ys' are short, and those in 'as,' 'es,' 'os', are long.

193. Though the general rule, that 'a vowel before a double consonant is long,' would make 'nix' long, the length of the 'i' in 'nivis' must be looked for, as the addition of 's' to the crude form to make the nom. has lengthened the short 'i' of 'nĭvis.'

194. A vowel or syllable ending in 'm' at end of word, before a word beginning with a vowel, is cut off.

195. The only feet or divisions of lines that we shall have at present to do with are a foot called a spondee, containing two long syllables, as 'cōntrā,' and a foot called a dactyl (finger), containing one long syllable followed by two short ones, as 'tĕmpŏrā.'

196. The verse called the hexameter contains six feet, of which the last must be a spondee, and the last but one a dactyl: the other four may be either.

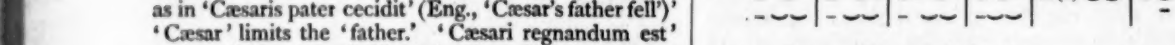
197. Every line is divided into two parts (that is, a word cannot begin at the end of the one part and finish at the beginning of the other): this division is called a cæsūra.

198. The cæsura generally takes place in the middle of the third foot, but sometimes in the middle of the fourth.

199. There must never be a cæsura after the first syllable of the fifth foot.

200. The last syllable of the line is common; that is, you may put a short or long, whichever is most convenient.

201. The scheme, then, of an hexameter is as follows. I use this mark ‖ for the cæsura, and this (‖) to show that no cæsura must take place after the first syllable of fifth foot:—



202. Let us, then, scan this line—

In sylvis acer est, equus acer Olympia vincit,

and first mark the syllables we know to be long or short by general rules, which will give us this—

In sylvis acer ēst, equus acer Olympĭa vīncit.

Now mark the final syllables according to the above rules, and we have—

In sylvīs acĕr ēst, equŭs acĕr Olympĭă vīncĭt.

Now as we cannot have, by scheme in 201, in these lines, one short syllable without another short syllable on one side or other of it, we know that the 'a' in the first 'acer' must be short, and since there cannot be three short syllables together, the 'a' in the second 'acer' must be long, and this being marked obliges the 'e' in 'equus' and the 'o' in 'Olympia' both to be short. So the scanning is this—

In syl | vīs ăcĕr | ēst ‖ ĕquŭs | ācĕr ŏ | lympĭă | vīncĭt,

where 'vincit,' being a final word, is considered equal to a spondee.

This, of course, shows that the two words 'acer' have distinct meanings—'ăcĕr' meaning a maple-tree, and 'ācĕr' meaning sharp, piercing, etc. There are many such pairs of words, so on this ground alone it is necessary to know something, at least, about the lengths of syllables.

203. EXERCISE 25.

A.

Scan the following twenty hexameters, marking the length of each syllable, the feet, and the cæsura in each line; in every one of which there will be found to be two words of the same form, or nearly so, with vowels of different lengths, as in the two 'acers' above. The cæsura in line 2 is in middle of fourth foot, and there are elisions (194) in verses 17 and 20, viz., the 'i' of 'pueri' and the 'o' of 'malo.'

Merx venit mercesque venit quæsita labore.
Voce canes; duc eja canes, nisi tempora canes.
Clava ferit: clavus firmat; clavisque recludit.
Ut placeas comiti, mores comes inde comes.
Comædi scenam, comedones quærite cenam.
Consule doctores; sic tu tibi consulis ipsi.
Bellandi cupido nocuit sua sæpe cupido.
Carmina dicuntur, Domino dum templa dicantur.
Solvere diffidit nodum qui diffidit ense.
Uxorem ducit vir; nubit sposa marito.
Educat hic catulos, ut mox educat in apros.
Si tibi non est æs, ēs inopes, et pinguia non es.
Fallit sæpe fretum placido nimis æquore fretum.
Sol nubes fugat, et fugit irreparabile tempus.
Per quod quis peccat, per idem mox plectitur idem.
Difficilis labor est, cujus sub pondere labor.
Frons pueri est levis, levis autem lingua puellæ.
In campis lepores, in libris quære lepores.
Non licet asse mihi qui me non asse licetur.
Malo egŏ mala meā bona quam mala frangere mala.

B.

(Words not hitherto given will be found in Vocabulary 26.)

1. We must remain (23) at Carthage (16) that we may save (10) (our) ships (9). 2. The father (14) was whipping (16) his (20) son (7) with his own (20) hand (8) that he might learn (6) his lessons (12). 3. No one (17) swims (16) in the winter (16). 4. Brutus (17) with (20) his (20) soldiers (6) conquered (23) Tarquin (17) by their (20) virtue (26). 5. The Romans (10) lost (20) four (23) ships (9) in the fight (26). 6. In the second (20) year (17) after (17) the kings (8) being expelled (26) (Eng., had been expelled) Tarquin (17) nearly (26) took (26) Rome (20). 7. In the winter (16) the bears (17) sleep (17) in a tree (1) or in a cave (17). 8. They have dipped (8) their (20) hands (8) into the cold (26) water (7). 9. We must descend (14) (Eng., run down) to the river (18) that we may wash (23) (Eng., bathe). 10. Pyrrhus (20) finished (6) a great (20) war (16) in Asia (18).

LESSON XXVI.

THE SECOND PERSON SINGULAR AND PLURAL OF PERFECT.

204. The second person singular of the perfect tense of the active voice is the only case in which it does not end in 's,' the termination being 'sti.' This 's' is also found in the second person plural of the same tense, which ends in 'stis.'

205. This tense, being so irregular and common, is given in full:—

Sing.—1.	Scivi	I knew	*Pl.*—Scivimus	We knew
,, 2.	Scivisti	Thou knewest	,, Scivistis	Ye knew
,, 3.	Scivit	He knew	,, Sciverunt	They knew

206. VOCABULARY 26.

English.	*Latin.*		*Derivative.*
Virtue, Valour	Virtus	G. Virtūtis	Virtuous
Fight (a), Battle	Prælium	G. Prælii, n. g.	
	m. f. n.		
Expelled being	Expulsus -sa -sum	R. Expuls	Expulsion
Cold	Frigĭdus -da -dum	R. Frigid	Frigid
Disease	Morbus	G. Morbi	Morbid
To perish	Pĕrīre	P. R. Peri	
Four times	Quăter, indecl. num. adv.		
To leave	Rĕlinquĕre	P. R. Relīqui	Relict
Almost	Pæne, an adverb		Peninsula
To take, To capture	Căpĕre	P. R. Cēp	Captive
Bravely	Fortĭter, an adverb		
Concerning, About	De, prep. gov. acc. case		
Hannibal	Hannĭbal	G. Hannibalis	
Africans	Afri (no sing.)	G. Afrorum (O noun)	
To cross	Transire	R. Transi	Transit
Cornelius	Cornēlius	R. Corneli	
Samnites	Samnites (no sing.)	G. Samnitium	
To complete, To destroy	Confĭcĕre	P. R. Confēc	
Epirus	Epīrus	G. Epiri	
To van	Currere	P. R. Cŭcurr	Curricle
From, Out of, Of	Ex, prep. gov. ab. case		Exclude
Achilles	Achilles	G. Achillis	
Race	Gĕnus	G. Gĕnĕris, n. g.	Generic
Origin	Orĭgo	G. Orĭgĭnis	Original
To trace, To draw	Trăhere	P. R. Trax	Traction
The Volsci	Volsci (no sing.)	G. Volscorum	
Corioli (a town)	Corioli (no sing.)	G. Coriolorum	
To renew	Rĕnŏvare	R. Renov	Renovation
Colleague	Collĕga	G. Collegæ	

207. EXERCISE 26.

A.

1. Epistolam (7) tua (20) manu (8) scripsisti (4). 2. Milites, (6) fortiter pugnavistis (10). 3. Fidem, (23) puer, (7) violavisti (17), igitur (13) te (Eng., you) verberabo (16). 4. Urbem, (7) milites, (6) servavistis (10). 5. Patrem, (14) mi (20) fili, (7) læsisti (4). 6. Epistolam (7) de te (Eng., you) scripsimus (4) ad (10) patrem (14). 7. Hannibal, Hamilcaris (23) filius (7), Afros duxit (9) contra (17) Romanos (20). 8. Hannibal Alpes (12) transiit. 9. Tu (Eng., you), Corneli, magnis (20) prælĭis Samnites confecisti. 10. (20) Pyrrhus (20) Epiri rex (8) ex genere Achillis originem trahebat.

B.

1. You (Lat., vos), boys (7), have hurt (4) your (20) master (13). 2. O Cornelius, you have destroyed your (20) enemies (10) and saved (10) (your) country (10). 3. The girls (8) had walked (3) in the garden (8) near (9) the river. 4. The Volsci renewed the war (16) and lost (20) Corioli. 5. In the second (20) year (17) Valerius, the colleague of Brutus, four times consul (17), perished from disease (abl. without prep.). 6. You, O boys (7), have played (12) too-long (Lat., diutius). 7. Have you not left your (20) sister (8) without-the-knowledge-of her (20) mother (14)? 8. (You) (sing.) have come (19) to Africa (10) that you may see (3) the high (20) mountains (20). 9. Have you not written (4) a letter (7) for your (20) father (14), that he may send (5) it (Lat., eam) to his (20) mother (14)? 10. Boys (7) must swim (16) in the summer (16).

LESSON XXVII.

RELATIVE PRONOUN.

208. The relative pronoun 'who' or 'which' is really a conjunction and a personal pronoun compounded.

209. 'Cæsar, *who* conquered Gaul, came home,' really means, 'Cæsar, *and he* conquered,' etc.

210. Before translating an English relative into Latin, always change it into its component parts, and you will never have any doubt as to its case.

211. THE THIRD CONCORD.—A relative agrees with its antecedent (that is, what it refers to) in gender and number, but *not in case.*

212. The relative may be in the same case as its antecedent, but that is an accident of the sentence, and not a necessary agreement.

213. In these three sentences—

(*a*) Cæsar, who took Gaul, etc.
(*b*) Cæsar, whom the Romans honoured, etc.
(*c*) Cæsar, whose wife died, etc.—

it will be readily seen by changing the relatives 'who,' 'whom,' and 'whose' into 'and he,' 'and him,' 'and of his,' or 'and his,' that the first must be nom., the second acc., and the third gen., though in each sentence the antecedent is nom.

214. The Latin relative 'qui' is thus declined. It is irregular in the masc. sing. acc. and in the neut. nom. and acc. It has no vocatives, and retains the old sing. gen. and dat. in 'ius' (generally written 'jus') and 'i' respectively.

	Singular.		
	m.	*f.*	*n.*
N.	Qui	Quæ	Quod
Ac.	Quem	Quam	Quod
G.		Cujus	
D.		Cui	
Ab.	Quo	Qua	Quo
	Plural.		
N.	Qui	Quæ	Quæ
Ac.	Quos	Quas	Quæ
G.	Quorum	Quarum	Quorum
D., Ab.	Quibus or Queis		

215. A relative clause generally describes its antecedent, and is at such time an adjective; and in analyzing a compound sentence it would be described as an adj. subordinate clause to the sentence (principal or otherwise) containing the antecedent.

216. VOCABULARY 27.

English.	*Latin.*		*Derivative.*
To return	Rĕdīre	P. R. Redi	
Light	Lux	G. Lūcis	Lucid
God	Deus (V. Deus)	G. Dei	Deist
Animal	Anĭmal (exc. I)	G. Animālis	
Now	Nunc, an adverb		
Weeping	Flētus	G. Fletus	
To learn	Discĕre	P. R. Didic	
To fly	Fŭgĕre	P. R. Fūg	Fugitive
Joy	Gaudium	G. Gaudii, n. g.	
To go away	Abire	P. R. Abi	
Yesterday	Hĕri, an adverb		
To-day	Hŏdie, an adverb		
To preach	Prædĭcare	R. Prædic	Predicate
Sermon	Sermo	G. Sermōnis	Sermon
Modesty	Pŭdĭcĭtia	G. Pudicitiæ	
To perceive	Percĭpio	P. R. Percēp	Perception
Heaven	Cœlum	G. Cœli, n. g.	Celestial
To see	Vĭdere	P. R. Vīd	Vision
Eloquence	Elŏquentia	G. Eloquentiæ	Eloquent
Hunter	Vēnātor	G. Venatoris	
	m. f. n.		
Fifth	Quintus -ta -tum	R. Quint	Quintet
All	Cunctus -ta -tum	R. Cunct	

217. EXERCISE 27.

A.

1. Puer (7) qui in flumine (5) natabat (16) periit (26). 2. Cæsar qui Galliam (16) cepit (26), Romam (20) rediit. 3. Mea (20) mater, (14) quam cuncti amaverunt (2), quinto anno (17) post (17) maritum (9) mortuum (Eng., death of her husband) morbo (26) periit (26). 4. Sol (7), qui reges (8) et servos (7) tepidat (10), cuncta sua (20) luce implet (12). 5. Deus, qui cuncta rectum (18) facit (15), et homines (5) et cuncta animalia amat (2). 6. Vos (Eng., you) pueri (7), qui recitata (12) recitavistis (14) nunc ludetis (12). 7. Fratrem (14), quem mater sua amavit (2), occidit (4). 8. Horatius sororem (8), cujus fletus se (Eng., him) vexavit (15), occidit (4). 9. Didici mea (20) dictata (12), nonne curram (4) in pratum (11)? 10. Discendum est ut sapiamus (6).

B.

1. Pyrrhus, whose soldiers (6) lost (20) their (20) ships (9), fled to Africa. 2. All who heard (4) the song (9) danced (2) (Eng., leapt) for joy. 3. The girl (8) whose mother (14) had gone away. 4. The boy (7) whom I whipped (16) yesterday is learning his (20) lessons (12) to-day. 5. Men (5) who teach (3) boys must learn. 6. He preached to the people (16) who left (26) the city (7) many (20) good (20) sermons. 7. The Roman (20) matrons (20) mourned (20) Brutus, who had defended (20) their (20) modesty, through (3) a year (17). 8. All who heard (4) Cicero (1) perceived (27) his (20) eloquence. 9. O God (see vocab.), who seest all (neut. gend.) (things), and who inhabitest (18) heaven, Thou hast taken (26) my (20) son (7). 10. The fox (8) whose puppies (14) were lying (13) in the grass (18) saw the dogs (14) and the hunters.

(To be continued.)

ANSWERS TO ALGEBRA QUESTIONS IN 'THE SCHOLAR,' FOR JULY, 1883.

EXERCISE XXIII.

(1) $\frac{b}{a}$ the part taken; $\frac{a-b}{a}$ part left.

(2) $x-y$ left; $\frac{x-y}{x}$ the part of original number.

(3) $\frac{2a^2c}{2abc}$, $\frac{16ade}{16bde}$, $\frac{4abd^2c}{4b^2d^2c}$

(4) $\frac{x(x+y)}{y(x+y)}$, $\frac{x^3(x^2-y^2)}{x^2y(x^2-y^2)}$, $\frac{5x^2y^2-4x^2y}{5x^2y^3-4xy^2}$

(5) $\frac{(a-b)^2}{a^2-b^2}$, $\frac{a^2-b^2}{a^2+2ab+b^2}$, $\frac{ax-bx+ay-by}{ax+bx+ay+by}$

(6) $\frac{2}{3a}$ (7) $\frac{a}{2}$ (8) $\frac{b}{c}$ (9) $\frac{1}{x-y}$

(10) $\frac{x-y}{x}$ (11) $\frac{a^2}{a-b}$ (12) $\frac{a-b}{a+b}$ (13) $\frac{x+a}{x-a}$

(14) $\frac{a+3}{a-5}$ (15) $\frac{a+2}{a-4}$ (16) $\frac{a+2}{a+3}$ (17) $\frac{x+3}{x+4}$

(18) $\frac{x+5}{2x^2+11x+12}$

ANSWERS TO ARITHMETICAL QUESTIONS IN 'THE SCHOLAR' FOR JULY, 1883.

STANDARD IV.

A. 1. £7925 3s. 3½d.
2. 88d. 3hr. 13m. 59s.
3. £39 7s. 9½d.—296.

B. 1. 19s. 4d.
2. £4308 13s. 6d.
3. 855,360 inches.

C. 1. 933,120 c. in.
2. 53 c. yds. 15 feet 1312 in.
3. £49,999 19s. 9¾d.

D. 1. 15 lb. 11 oz. 6 dwts. 11 grs.
2. 75,492 sq. in.
3. £47 1s. 10½d.

E. 1. 8s. 5½d.
2. £91 16s. 2¾d.
3. £633 19s. 6d.

F. 1. £2 13s. 9½d.
2. 8¾d.
3. 32 ton 3 cwt. 1 qr. 16 lbs.

Advanced Examination.

1. £59.
2. 31½ gallons.
3. 10·55 a.m.

STANDARD V.

A. 1. £538 9s. 7¾d.
2. £2435 3s. 2½d.
3. £1847 17s. 4½d.

B. 1. £1680 17s. 2d.
2. £25 12s. 6d.
3. £3335 18s. 9d.

C. 1. 320 eggs.
2. £11 10s. 7½d.
3. £9 18s. 6¾d.

D. 1. 3½s.
2. £3 17s. 10½d.
3. 1s.

E. 1. £15,567 15s.
2. £3 16s. 1$\frac{9}{10}$d.
3. 3$\frac{1}{6}$.

F. 1. 12 ton 17 cwt. 16 lbs.
2. £304 3s. 8d.
3. £1,681,938 17s. 11½d.

Advanced Examination.

1. 2s. (boy).
2. £1452 17s. 0$\frac{17}{19}$d.
3. £49 17s. 8¼d.

STANDARD VI.

A. 1. ·021796875.
2. $1\frac{1}{144}$.
3. £1 2s. 8d.

B. 1. £19 2s. $8\frac{7}{10}$d.
2. ·0027557.
3. £27 15s. $6\frac{3}{4}$d.

C. 1. £1 13s. $0\frac{5}{12}$d.
2. £2 5s. 8·352d.
3. $\frac{8}{15}$ lb.

D. 1. £1 15s. $10\frac{8}{21}$d.
2. $3\frac{1}{2}$ years.
3. ·000003348+

E. 1. 135 to 128.
2. 11s. $0\frac{5}{11}$d.
3. $4\frac{1}{2}$ per cent.

F. 1. $5\frac{7}{40}$.
2. $10\frac{1}{2}$ hours.
3. 10s. $4\frac{4}{11}$d.

Advanced Examination.

1. $2\frac{1}{2}$ days *before*.
2. $14\frac{3}{4}\frac{1}{6}\frac{1}{4}$.
3. £8500.

STANDARD VII.

A. 1. £59 0s. $10\frac{1}{2}$d.
2. £24 17s.
3. $21\frac{1}{2}$ per cent.

B. 1. £766 6s. $7\frac{1}{11}$d.
2. $8\frac{1}{2}$ per cent.
3. £3 5s. $4\frac{5}{11}$d.

C. 1. £5250.
2. $4\frac{1}{11}$ per cent.
3. $22\frac{5}{16}$ per cent. gain.

D. 1. £74 0s. $3\frac{5}{16}$d.
2. $5\frac{7}{80}$d. average.
3. $5\frac{5}{17}$ per cent.

E. 1. 228 on Friday p. m.
2. 3s. $7\frac{1}{2}$d.
3. £12,000 8s. $4\frac{1}{2}$d.

F. 1. £11 16s. $11\frac{1}{2}$d.
2. $4\frac{1}{2}$ per cent.
3. £146 10s. 10·62d.

Advanced Examination.

1. £6 15s. 6d. per cent.
2. £2058 yearly gain.
3. £46 12s. $1\frac{5}{11}$d. increase.

SOLUTIONS OF THE ADVANCED EXAMINATION QUESTIONS IN 'THE SCHOLAR' FOR JULY, 1883.

STANDARD IV.

1. £156 − £10 10s. = £145 10s., which ÷ 3 = £48 10s., value of each horse; hence £48 10s. + £10 10s. = £59. Ans.

2. $1\frac{1}{2}$ pints × 12 × 42 = 756 pints = $94\frac{1}{2}$ gallons; then 126 − $94\frac{1}{2}$ = $31\frac{1}{2}$ gals. Ans.

3. 8 hr. 40 min. = 520 min., and 2 r. 20 per. = 5 *half* roods; hence 520 min. ÷ 8 = 65 min. over *one* half rood, and 65 min. × 5 = 325 min. = 5 hr. 25 min. time occupied, which before 4·20 p.m. gives 10·55 a.m. Ans.

STANDARD V.

1. Bringing the men and women's shares to their equivalents in boys' shares, we have 40 men's shares = 60 women's shares = 90 boys' shares; the 60 women = 90 boys; + the 80 boys = a total of 260 boys. And £26 ÷ 260 = 2s., a boy's share. Ans.

2. 83,750 lbs. = 37 ton 7 cwt. 3 qr. 2 lbs., which, by practice, at £38 17s. 2d. a ton gives £1452 17s. $0\frac{17}{77}$d. Ans.

3. The five items:—£11 4s. + £11 17s. 6d. + £20 12s. 6d. + £18 10s. + £8 4s. 6d. = £70 8s. 6d.; and $3\frac{1}{2}$d. in 1s. on this amount = £20 10s. $9\frac{1}{2}$d., giving a net result of £49 17s. $8\frac{1}{2}$d. Ans.

STANDARD VI.

1. Simplified, the question is—'If 60 men do 500 yds. in 36 days, in what time can 48 men do 460 yds.?'
Then, by proportion and cancelling—
$\frac{36\text{d.} \times 460 \times 60}{500 \times 48} = \frac{414}{10} = 41\frac{2}{5}$ days, time required for the last 460 yards. Hence 80 − (36 + $41\frac{2}{5}$) = $2\frac{3}{5}$ days before the time. Ans.

2. $7\frac{1}{12}$ sum + $2\frac{5}{12}$ diff. + $11\frac{1}{19}$ prod. + $2\frac{1}{38}$ and $\frac{38}{57}$ the two quotients = $23\frac{1}{1}\frac{7}{9}\frac{2}{0}\frac{8}{0} = \frac{2}{1}\frac{3}{0}\frac{1}{0}\frac{4}{0}\frac{4}{0}$; and $2\frac{1}{38} - \frac{38}{57} = \frac{7}{114}\frac{5}{8}$, the difference between the two quotients. Inverting this divisor and cancelling, we have $\frac{2}{1}\frac{3}{0}\frac{1}{0}\frac{4}{0}\frac{4}{0} \times \frac{114}{5} = \frac{2}{5}\frac{3}{0}\frac{1}{0}\frac{4}{0}\frac{4}{0} = 14\frac{3}{5}\frac{1}{0}\frac{4}{0}$. Ans.

3. 146 days = $\frac{146}{365} = \frac{2}{5}$ year. £170 ÷ 2 = £85 interest for $\frac{1}{2}$ year = £425 a year. Five per cent. being $\frac{1}{20}$ of the principal, £425 × 20 = £8500. Ans.

STANDARD VII.

1. £30,000 × 52 × ·45 = £702,000 *net* annual receipts. Four per cent. on £1,500,000 = £60,000; and five per cent. on £2,000,000 = £100,000. Then £702,000 − £160,000 = £542,000 dividend on the £8,000,000 ordinary stock. £8,000,000 = 80,000 *hundreds*, hence £542,000 ÷ 80,000 = £$6\frac{4}{8}$, or £6 15s. 6d. per cent. Ans.

2. £42·875 × 304 = £13,034 yearly receipts. The goods that cost £100 will sell for £$118\frac{3}{4}$, hence the cost price is $\frac{100}{118\frac{3}{4}} = \frac{4}{4}\frac{0}{7}$ = $\frac{8}{9}$ of the selling price, and consequently the *gain* must be $\frac{1}{9}$ of the selling price; − $\frac{1}{9}$ of £13,034 = £2508. Ans.

3. £3 × 60 = £180 annual income from consols. £$101\frac{1}{4}$, less $\frac{1}{4}$ for broker = $101\frac{1}{2}$, which × 60 = £6090 received for sale of consols. Again, $107\frac{3}{8} + \frac{1}{8}$ for broker = £$107\frac{1}{2}$ cost of each £100 of 4 per cent. stock; and £6090 − £$107\frac{1}{2}$ = $56\frac{2}{3}$ *hundred* of stock bought. Hence £4 × $56\frac{2}{3}$ = £226 12s. $1\frac{5}{11}$d. income from 4 per cents.; then £226 12s. $1\frac{5}{11}$d. − £180 = £46 12s. $1\frac{5}{11}$d. increase. Ans.

ANSWERS TO ARITHMETICAL QUESTIONS IN THE 'LITTLE LEARNER,' FOR JULY, 1883.

STANDARD I.

A. (1) 288
(2) 105
(3) 185

B. (1) 2,359
(2) 947
(3) 906

C. (1) 1,256
(2) 1,158
(3) 2,498

D. (1) 410
(2) 134
(3) 536

E. (1) 136
(2) 608
(3) 88

F. (1) 254
(2) 291
(3) 799

G. (1) 29,029
(2) 9,870
(3) 18,277

H. (1) 2,618
(2) 978
(3) 97

I. (1) 12,212,715
(2) 219 oranges
(3) 403 miles

J. (1) 135
(2) 54,484,236
(3) 328 pears

STANDARD II.

A. (1) 350,882
(2) 162,536
(3) 109,752

B. (1) 5,118
(2) 10,496
(3) 79,531

C. (1) 339,773
(2) 8,734,140
(3) 21,422,500

D. (1) 3,229,680
(2) 2,338,310
(3) 56,689,217

E. (1) 42,717,480
(2) 4,350,096,916
(3) 5,567,749,311

F. (1) 12,635
(2) 23,796 + 2
(3) 13,668

G. (1) 6,094
(2) 10,334 + 4
(3) 7,373 + 1

H. (1) 4,026 + 40
(2) 607 + 495
(3) 6,391 + 67

I. (1) 6s. 1d.; 8s. 10d.; 11s. 9d.
(2) 382
(3) 1,757 apples

J. (1) 456,000 slates
(2) 8 years
(3) 125 days

STANDARD III.

A. (1) 1,365
(2) 2,593 + 24
(3) 907

B. (1) 14,152 + 14
(2) 7,654
(3) 7,257 + 90

C. (1) 14,928 + 46
(2) 3,480
(3) 10,772 + 611

D. (1) 27,146 + 980
(2) 8,309
(3) 9,843 + 5,020

E. (1) £27 19s. 10d.
(2) £278 8s. $10\frac{3}{4}$d.
(3) £1,619 13s. $0\frac{1}{2}$d.

F. (1) £13,696 10s. 1d.
(2) £6,054 18s. $4\frac{3}{4}$d.
(3) £112,861 8s. $8\frac{1}{4}$d.

G. (1) £421 4s. 9d.
(2) £507 18s. $7\frac{3}{4}$d.
(3) $\frac{1}{4}$d.

H. (1) £387 14s. $8\frac{1}{4}$d.
(2) £3,007 17s. $7\frac{1}{2}$d.
(3) £70,146 7s. $0\frac{3}{4}$d.

I. (1) 928 books
(2) £5 10s. 11d.
(3) £1 10s. $0\frac{3}{4}$d.

J. (1) 930 slates
(2) 1,016 children
(3) £98 13s.

SUMMER IS COME.

T. CRAMPTON.

Cheerfully. mf
1st Treble
2nd Treble.
Bass.
1. Wel - come, sweet sea - son bright! Sum - mer, so dear! Moun-tain and val - ley no
2. Meek lit - tle vi - o - lets, hid - ing from view, Gold - en - eyed dai - sies all
Key Bb. Cheerfully. mf
F. t. f
long - er are sere; Wake, pret - ty li - ly - bells, List the bees' hum!
spark - ling with dew; Join with the song - birds and bees' plea - sant hum,
f. Bb. p
Join in the cho - rus, bright sum - mer is come; Sum - mer is come, Sum - mer is
Sum - mer is come.....
come, Sum - mer, bright sum - mer is come; Sum - mer, bright
sum - mer; Sum-mer, bright sum-mer is come.
Symph. f
Symph. f

The Practical Teacher.

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ANSWERS TO

Pupil Teachers' Examination Papers.

MAY 26.

FIRST YEAR.

Pupil Teachers at end of First Year.

Arithmetic.

Three hours and a half allowed.

MALES.

1. Simplify—

$$3+\cfrac{2}{2}{\Big/}\cfrac{2}{1+\cfrac{1}{3+\cfrac{1}{4+\frac{1}{2}}}} \quad ; \text{ and } \frac{3\frac{1}{2}-1\frac{3}{4} \text{ of } 1\frac{2}{5}}{3\frac{1}{4}+1\frac{3}{4}}.$$

(*a*)

$$3+\cfrac{2}{2}{\Big/}\cfrac{2}{1+\cfrac{1}{3+\cfrac{1}{4+\frac{1}{2}}}} = 3+\frac{2}{\frac{2}{1+3\frac{2}{3}}}$$

$$= 3+\frac{2}{1\frac{1}{10}}$$

$$= 3\frac{8}{7} = 4\frac{1}{7}. \text{ Ans.}$$

(*b*)

$$\frac{3\frac{1}{2}-1\frac{3}{4} \text{ of } 1\frac{2}{5}}{3\frac{1}{2}+1\frac{3}{4}} = \frac{3\frac{1}{2}-\frac{7\times 8}{4\times 5}}{4\frac{1}{4}}$$

$$= \frac{3\frac{1}{2}-2\frac{1}{5}}{\frac{17}{4}}$$

$$= \frac{7\times 4}{10\times 21} = \frac{2}{15}. \text{ Ans.}$$

2. Find the G.C.M. of 1155, 1518, and 2299; and the L.C.M. of 126, 210, and 294.

(*a*)

3	1155	1518
	1089	1155
2	66	363 5
	66	330
		33

(*b*)

1	33	2299 69
	22	198
11	319	
	297	
	22	2
	22	

∴ The G.C.M. required is 11. Ans.

(*c*)

2	126, 210, 294
3	63 105 147
7	21 35 49
	3 5 7

L.C.M. = 2×3×3×5×7×7 = 4410. Ans.

3. State how to find the decimal point in the quotient obtained by dividing one terminating decimal by another.

Divide to 4 decimal places 234·25 by 37·6 and ·23425 by 376.

Remove the decimal point of the divisor altogether, and shift the decimal point of the dividend as many places to the right as there were decimal places in the divisor, annexing for this purpose decimal cyphers, if necessary, to the dividend.

Then divide as if the given decimals were common numbers; and when in the process of division, the decimal point of the dividend is reached, place a decimal point in the quotient.

(*a*)

37·6)234·25 (6·2300... Ans.
2256
865
752
1130
1128
200
...

(*b*)

376)·23425 (·0006.... Ans.
2256
....

4. Find the exact rent of 23·26⅔ acres of land of £2·97 per acre.

£
23·263
2·97
162845
2093727
4652727
£69·093
20
1·86s.
12
10·32d.

∴ the rent = £69 1s. $10\frac{8}{13}$d.

FEMALES.

1. Find the cost of 356 acres 3 roods $39\frac{1}{2}$ poles, at £2 13s. 4d. per acre.

		£	s.	d.
Cost of 1 acre	=	2	13	4
				357
,, 356 acres	=	952	0	0
Deduct cost of $\frac{1}{2}$ po. = $\frac{1}{1\frac{1}{2}\frac{1}{0}}$ of 1 acre	=			2
Total cost	=	951	19	10

2. What will be the value of one hundred and two thousand two hundred and eighty-six articles, at £14 13s. $3\frac{1}{2}$d. each.

		£	s.	d.
Value of whole at £1 each	=	102,286	0	0
				14
,, ,, £14 ,,	=	1432004	0	0
,, ,, 10s. ,, = $\frac{1}{2}$ val. at £1	=	51143	0	0
,, ,, 3s. 4d. ,, = $\frac{1}{3}$,, 10s.	=	17047	13	4
		1500194	13	4
Deduct value of whole at $\frac{1}{2}$d. = $\frac{1}{1\frac{1}{2}\frac{1}{0}}$ at 3s. 4d.	=	106	10	$11\frac{1}{2}$
		1500088	2	$4\frac{1}{2}$

3. Find the least common multiple of 194, 291, and 216.

2	194	291	216
3	97	291	108
		97	36

∴ L.C.M. = 2 × 3 × 97 × 36 = 20952. Ans.

4. Make out and receipt the following bill :—

$19\frac{1}{2}$	yards calico	at	$7\frac{1}{2}$d.	per yd.	
$16\frac{3}{4}$	,,	flannel	at 1s. 2d.	,,	
$11\frac{1}{2}$	,,	Holland	at 10d.	,,	
$15\frac{3}{4}$	,,	print	at $8\frac{1}{2}$d.	,,	
$3\frac{1}{4}$	,,	muslin	at 1s. 6d.	,,	
$17\frac{1}{2}$	,,	linen	at 1s. 3d.	,,	
$13\frac{1}{4}$	,,	sheeting	at 1s. 5d.	,,	
9	,,	ribbon	at $7\frac{1}{2}$d.	,,	
$10\frac{1}{2}$	,,	,,	at $4\frac{1}{2}$d.	,,	

		s.	d.		£	s.	d.
$19\frac{1}{2}$	yds. at	0	$7\frac{1}{2}$	per yd. =	0	12	$2\frac{1}{2}$
$16\frac{3}{4}$	,, ,,	1	2	,, ,, =	0	19	$6\frac{1}{2}$
$11\frac{1}{2}$	,, ,,	0	10	,, ,, =	0	9	7
$15\frac{3}{4}$	,, ,,	0	$8\frac{1}{2}$	,, ,, =	0	10	$11\frac{1}{2}$
$3\frac{1}{4}$	,, ,,	1	6	,, ,, =	0	5	$7\frac{1}{2}$
$17\frac{1}{2}$	,, ,,	1	3	,, ,, =	1	1	$10\frac{1}{2}$
$13\frac{1}{4}$	,, ,,	1	5	,, ,, =	0	18	$9\frac{1}{2}$
9	,, ,,	0	$7\frac{1}{2}$	,, ,, =	0	5	$9\frac{1}{2}$
$10\frac{1}{2}$	,, ,,	0	$4\frac{1}{2}$	,, ,, =	0	3	$11\frac{1}{2}$
					5	8	$3\frac{1}{2}$ Ans.

Received payment—

£3 : 19 : 11
Pupil Teacher,
26/5/83.

5. Find the value of $2+\frac{3}{4}+1\frac{3}{4}+4\frac{5}{6}+5\frac{1}{2}\frac{3}{4}$.

$2+\frac{3}{4}+1\frac{3}{4}+4\frac{5}{6}+5\frac{1}{2}\frac{3}{4} = 12\frac{48+54+64+39}{72}$

$= 14\frac{5}{6}$. Ans.

Grammar.

1. Parse and analyse the following sentence :—

'And art thou cold and lowly laid,
Thy foeman's dread, thy people's aid,
Breadalbane's boast, Clan-Alpine's shade?'

PARSING.

And—co-ord. conj., introducing the sentence.
art—irreg. intrans. verb, *am, was, been*, indic., pres. indef., 2nd pers., sing., agr. with 'thou.'
thou—pers. pron., 2nd pers., sing., mas., nom., subj. of 'art.'
cold—predic. adj., qual. 'thou.'
and—co-ord. conj., connect. 'art thou cold' with 'art thou lowly laid.'
lowly—adv. of manner, mod. 'laid.'
(*art*) *laid*—irreg. trans. verb, *lay, laid, laid*, pass. voice, indic., pres. indef., 2nd pers., sing., agr. with 'thou.'
(1) *thy*—pronom. poss. adj., attrib. to 'foeman's.'
(2) *thy*— ,, ,, ,, 'people's.'
foeman's—com. noun, mas., sing., poss., attrib. to 'dread.'
dread, *aid*, *boast*, *shade*} abst. nouns, neut., sing., nom., in appos. with 'thou.'
people's—com. coll. noun, neut., sing., poss., attrib. to 'aid.'
Breadalbane's—prop. noun, ,, ,, ,, ,, ,, 'boast.'
Clan-Alpine's— ,, ,, ,, ,, ,, ,, ,, 'shade.'

ANALYSIS.

(1) (And) thou ..... subject.
thy foeman's dread, thy people's aid, Breadalbane's boast, Clan-Alpine's shade } enlargement of subject.
art cold ..... predicate.

(2) and (art thou) lowly laid.
and ..... connective.
(*thou*) ..... subject.
art laid ..... predicate.
lowly ..... manner.

2. What terminations of nouns indicate the feminine gender? Give examples.

The following endings denote the feminine gender :—
—ess ; as, countess, mistress, lioness.
—ine, —ina ; as, heroine, Josephine, Alexandrina.
—ix ; as, executrix, directrix.
—a ; as, donna, Infanta, signora.

3. Give instances of verbs ending in *-k*, *-n*, *-ate*, *-ize*, and *-fy*, and explain the derivation and force of these verbal suffixes.

The Saxon *—k* is frequentative: hark (hear), talk (tell).
The Saxon *—n* is causative: heighten ; lengthen, from height and length.
—ate is of classical derivation, and means 'to make': animate, modulate, stagnate.
—ize is from the Greek, and is causative: sermonize, tantalize, fraternize.
—fy, from the Latin '*fio*,' means to 'to make': deify, beautify, rectify.

Geography.

Answer two questions.

1. What is a *watershed?* Describe the chief watersheds of Scotland, and of Australia.

Watershed and *waterparting* are two words belonging to the supply of water to rivers. A waterparting is the spot or line at which the surface-water of a mountain, hill, or swelling ground parts and begins to flow down the slope on each side. Some mountains have a ridge almost as sharp as that of a roof, others are more irregular. Some undulating ground is pretty flat on the whole, and it is difficult to say by the eye where the waterparting is ; but water will always find its own level, and there is always a line at which the water will, of itself, flow down the one side or the other, and the line, straight or crooked, is the waterpart-

ing. The waterparting being the ridge or highest line between the streams, the watershed is the whole ground between the waterparting and the stream.

In *Scotland* the Grampians, which are the loftiest mountains in the British Isles, cross the country in its widest part. They for the most part separate the Highlands from the Lowlands, and the basins of the Spey and Dee from that of the Tay on the east side, and the great valley of Glenmore and the Clyde basin on the west.

The Ochil and Sidlaw Hills, parallel with the foregoing, and separated from them by the valley of Strathmore, consist of three small chains which extend across the country from Forfarshire to Stirlingshire, and form the N. waterparting of the Tay, Forth, and Clyde basins.

The Lammermuir and Pentland Range forms the southern boundary of the Forth basin.

The Cheviot and Lowther range forms the great waterparting of the south of Scotland, and separates the basins of the Clyde and Tweed on the N. from those of the Solway and Tyne on the South.

In ***Australia***, the only watershed of any importance is formed by the Australian Alps, which run south through New S. Wales, enter Victoria, and extend W. to the Pyrenees, separating the basin of the Murray from the streams flowing south.

2. Draw a map of the coast-line from the Straits of Dover to the mouth of the Humber.

3. Name and describe fully the chief towns of British North America.

Ottawa possesses great advantages as the capital of the Dominion.

Toronto, the third city in Canada, is the grand emporium for wheat.

Quebec, the stronghold of Canada, is a great entrepôt for the trade of the Dominion.

Montreal, the largest and most commercial city in Canada, is very handsome. The famous Victoria Bridge carries the Grand Trunk Railway over the St. Lawrence.

Halifax, the capital of Nova Scotia, has one of the finest harbours in the world.

St. John's, the capital of Newfoundland, is much resorted to during the fishing season.

History.

1. Mention the chief towns which grew up in this island during its occupation by the Romans.

The chief towns which grew up during the Roman occupation were Chester, York, Lincoln, Chichester, Carlisle, Winchester, Rochester, Dorchester, Canterbury, and St. Alban's.

2. What were the Saxon Bretwaldas? Name princes who bore the title, and tell to what kingdoms they belonged.

The Saxon Bretwaldas were princes who obtained a kind of supremacy and authority over the other rulers of the kingdoms forming the Heptarchy.

Ella, King of the South Saxons; Ethelbert of Kent; Edwin of Northumbria; Oswald, successor to Edwin; Oswy, successor to Oswald; and Egbert of Wessex were Bretwaldas.

3. Who was the Venerable Bede? Why should he be remembered by friends of education?

The Venerable Bede was a monk of the monastery of Jarrow, and, as he says himself, his constant pleasure lay in learning, or teaching, or writing. While still young, he became a teacher, and six hundred monks, besides strangers that flocked thither for instruction, formed his school of Jarrow. He compiled text-books for his scholars, and forty-five works remained after his death to bear witness to his prodigious industry. In his 'Ecclesiastical History of the English Nation,' Bede was the first English historian. He was the father of our national education, and therefore should be remembered by all friends of education.

Composition.

Write from memory the substance of this passage:—

'Diving for sponges is practised from May to September, but only when the sea is calm, and to a depth not beyond fifty feet. The naked diver, having a bag and a knife secured to his waist, holds the lead or stone in both hands, and plunges into the sea. He gathers such sponges as offer as rapidly as he can, cutting them loose with the knife, and thrusting them into the bag. When breathing-time approaches, he signals by the line to which the weight is attached, and his mates haul him to the surface without loss of time. Experienced sponge-divers will remain below from three and a half to four minutes; but they lead a hard and perilous life, and many are drowned when the sea suddenly becomes rough, as it so often does in the Mediterranean.'

Needlework.

FEMALE.

One hour will be allowed for this exercise in the afternoon.

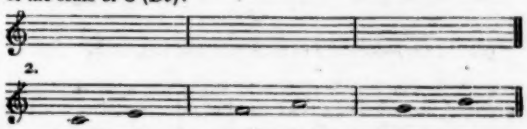
Music.

A quarter of an hour allowed for this paper.

1. Write above each of the following notes its value-name (semibreve, &c.): and write below each its pitch-name (C, *Do*, &c.):

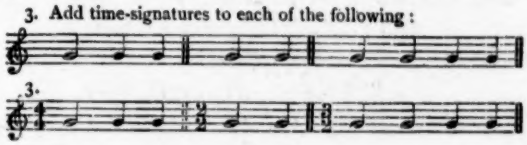
1.

2. Write down the major thirds contained between the notes of the scale of C (*Do*):



2.

3. Add time-signatures to each of the following:



3.

TONIC SOL-FA NOTATION.

1. Write (*a*) a five-pulse tone, using two-pulse measure, and (*b*) a four-pulse tone, using three-pulse measure.

1. (*a*) |1 :— |— :— |— : ‖

(*b*) |1 :— :— |— : : ‖

2. Write down the major thirds contained between the notes of the common scale.

2. (1) Between *doh* and *me*; (2) *fah* and *lah*; (3) *soh* and *te*.

3. Write the following an octave higher, and state what is meant by the direction as to key:—

KEY D.

|d :s |m :l |s :t, |l, :t, |d :— ‖

3. KEY D.

|d' :s' |m' :l' |s' :t |l :t |d :— ‖

A common scale may be founded on any tone of absolute pitch, and it is said to be in the key of that tone which it takes for *doh*; thus, Key D directs that after sounding the pitch of C on a tuning-fork, the singer is to run down to D (*ray*), the pitch tone required for *doh*.

SECOND YEAR.

Pupil Teachers at end of Second Year.

Three hours and a half allowed for this Paper.

Arithmetic.

MALES.

1. The amount of £500 7s. 6d. for 10 years at simple interest is £675 10s. 1½d.; find the rate of interest per cent. per annum.

£500½ : £100 } :: £175 2s. 7½d. : rate.
10 yrs. : 1 yr. }

$\frac{84063 \text{ halfd.} \times 800}{4003 \times 10} = 1680 \text{ halfd.} = \underline{£3\frac{1}{2}}$. Ans.

2. A train travels 10 minutes at 50 miles an hour, 15 minutes at 45 miles, and 20 minutes at 36 miles; find its average rate for the whole of the time.

mls.
Distance travelled in 10 min. $= \frac{50 \times 10}{60} = 8\frac{1}{3}$
" " 15 " $= \frac{45 \times 15}{60} = 11\frac{1}{4}$
" " 20 " $= \frac{36 \times 20}{60} = 12$
" " 45 " $= 31\frac{7}{12}$

∴ 45 min. : 60 min. :: $31\frac{7}{12}$: average rate per hour.

$\frac{31\frac{7}{12} \times 60}{45} = \frac{126\frac{1}{2}}{3} = \underline{42\frac{1}{2} \text{ mls.}}$ Ans.

3. A cask which holds 20 gals. is filled with 15 gals. of brandy and 5 of water; 4 gals. of the mixture is drawn off, and the cask is again filled with water. Find the percentage of brandy in the second mixture.

(*a*) $\frac{15}{20}$ or $\frac{3}{4}$ of the whole = brandy.
(*b*) 4 gals. of mixture drawn off takes $\frac{1}{5}$ of the whole; of which $\frac{1}{5}$ of $\frac{3}{4}$ or $\frac{3}{20}$ must be brandy.
(*c*) $\frac{3}{20}$ taken from $\frac{3}{4}$ leaves $\frac{15-3}{20}$ or $\frac{3}{5}$ of second mixture as brandy.
(*d*) ∴ the percentage of brandy is $\frac{3}{5}$ of 100, or $\underline{60}$. Ans.

4. A person invests £4680 in the 3 per cents. and gets a dividend therefrom of £144; find the price of stock, brokerage being $\frac{1}{8}$ per cent.

144 : 3 :: £4680 : price of stock to buyer

$\frac{£4680 \times 3}{144} = 97\frac{1}{2}$

∴ Price of stock = $97\frac{1}{2} - \frac{1}{8} = \underline{97\frac{3}{8}}$. Ans.

FEMALES.

1. Simplify $(4\frac{2}{5} + 1\frac{4}{7} + 1\frac{1}{2})$ of $(8\frac{2}{5} - 6\frac{3}{8})$

(*a*) $4\frac{2}{5} + 1\frac{4}{7} + 1\frac{1}{2} = 6\frac{42+40+35}{70} = 7\frac{17}{70}$

(*b*) $8\frac{2}{5} - 6\frac{3}{8} = 8\frac{16}{40} - 6\frac{15}{40} = 2\frac{1}{40}$

(*c*) $7\frac{17}{70} \times 2\frac{1}{40} = \frac{537 \times 20}{70 \times 9} = \underline{17\frac{1}{21}}$. Ans.

2. What fraction added to $1\frac{2}{7}$, $3\frac{3}{5}$, and $5\frac{7}{12}$ will make a sum total of 12?

$1\frac{2}{7} + 3\frac{3}{5} + 5\frac{7}{12} = 9\frac{60+56+49}{84} = 10\frac{29}{84}$

∴ $12 - 10\frac{29}{84} = \underline{1\frac{55}{84}}$, fraction required. Ans.

3. Add together $4\frac{6}{11}$ days, $5\frac{1}{3}$ hours, $7\frac{1}{4}$ minutes, and 25 seconds.

	dys.	hrs.	min.	sec.
$4\frac{6}{11}$ days =	4	12	0	0
$5\frac{1}{3}$ hrs. =	0	5	33	20
$7\frac{1}{4}$ min. =	0	0	7	$8\frac{1}{4}$
				25
	4	17	40	$53\frac{1}{4}$

Ans.

4. One partner in a business, whose share is $\frac{8}{11}$ of the whole, receives from it £214 16s. profit. What share has another who receives £492 5s.

£214 16s. : £492 5s. :: $\frac{8}{11}$: ?
or or
4296s. 9845s.

$\frac{2 \times 9845}{11 \times 4296} = \frac{8 \times 9 \times 5}{11 \times 8} = \underline{\frac{45}{11}}$. Ans.

5. Reduce to decimals $1\frac{6}{11}$ of $2\frac{3}{8}$, and $\frac{3\frac{1}{2}}{2\frac{3}{8}}$

(*a*) $1\frac{6}{11}$ of $2\frac{3}{8} = \frac{17}{11}$ of $\frac{19}{8} = \frac{323}{88} = 3{\cdot}67875$

(*b*) $\frac{3\frac{1}{2}}{2\frac{3}{8}} = \frac{7 \times 3}{2 \times 8} = \frac{21}{16} = \underline{1{\cdot}3125}$. Ans.

Grammar.

1. 'But *let* us ever praise Him and *extol*
His bounty, *following* our delightful task
To prune these growing plants and *tend* these flowers;
Which, *were* it toilsome, *yet* with thee *were sweet*.'

Analyse the above, and parse the words in italics.

Sentence.	Kind.	Subject.	Predicate.	Completion.	Extension.	Connective.
(1) But let us ever praise Him.	Principal	(thou)	let	us (object) praise Him (complement)	ever (time)	but
(2) And (let us) extol His bounty following..... flowers.	Principal co-ord. with (1)	(thou)	(let)	(us) (object) extol His bounty (complement) following, etc. ....flowers (enlargt. of 'us')		and
(3) Which yet with thee were sweet.	Subord. adjec. to phrase 'following.... flowers'	which	were sweet		with thee (manner)	yet
(4) Were it toilsome.	Sub. adv. to (3)	it	were toilsome			(though)

PARSING.

Let—irreg. trans. verb, *let*, *let*, *let*, imper., 2nd pers., sing., agr. with (thou).
extol—reg. trans. verb, infin., pres. indef., gov. by 'let.'
following—reg. trans. verb, incomplete part., predic. of 'us.'
tend—reg. trans. verb, infin., pres. indef., attrib. to 'task.'
which—simpl. rel. referring to the phrase 'following..... flowers,' neut., sing., nom., subj. of 'were.'
were—irreg. intrans. verb, *am*, *was*, *been*, past. indef., 3rd pers., sing., agr. with 'which.'
yet—advers. conj., connecting 'it were toilsome' and 'it were sweet.'
were—as before, agr. with 'it.'
sweet—adj., predic. of 'it.'

2. What Latin prefix occurs in the above passage? Mention some words in which the same prefix undergoes a modification.

The Latin prefix is *ex*, which also takes the forms *ec*, *ef*, *e*; as *ec*centric, *ef*fect, *e*dit.

3. Pick out any Latin termination in the above passage. What adjective with the same meaning, but with a Latin termination, could you suggest for 'toilsome'?

A Latin termination in the above is *-ty*.
'Laborious' might be substituted for 'toilsome,' the -ous being a Latin termination.

4. Paraphrase the following passage :—

'Not always fall of leaf, nor always spring;
Not endless night, nor yet eternal day;
The saddest birds a season find to sing;
The roughest storm a calm may soon allay.
Thus with succeeding turns God tempereth all;
That man may hope to rise, yet fear to fall.'

—SOUTHWELL.

From the succession of ever-varying seasons, from the constant change of darkness and light, from the occasional joyful piping of even those birds which are considered tuneless, and from the fact that a lull follows even the fiercest storm, man may learn that God does not condemn him to a life of despair, but teaches him to look forward to a better, and at the same time warns him against a worse state.

Geography.

1. Draw a full map of Belgium and Holland, and describe the chief towns of both countries.

Brussels, the capital of Belgium, is adorned with many fine buildings, fountains, and public walks of great beauty. It has many literary and scientific institutions.

Antwerp is a large and strongly-fortified city, and the chief emporium of Belgian commerce. It has a famous cathedral, and many valuable works of art.

Ghent, a walled and fortified town, intersected by canals, has been called the 'Manchester' of Belgium.

Liege is a fortified and populous city, and the 'Birmingham' of Belgium.

Amsterdam, the capital of Holland, is one of the most important commercial towns in Europe. It is built of brick in the form of a crescent, and supported on piles driven into the alluvial soil.

Rotterdam, the chief town in South Holland, is more favourably situated for commerce than Amsterdam, is intersected like most Dutch towns by canals, and is the great emporium for colonial produce.

The Hague may be regarded as the political capital of Holland, has a rich gallery of paintings, and is one of the most regularly-built cities in Europe.

Utrecht is the oldest of Dutch towns, and contains a flourishing university.

2. What are the causes which affect climate? Illustrate your answer by reference to British India and Cape Colony.

The chief causes which affect the climate of a country are: (1) its latitude or distance from the equator; (2) its elevation or height above the level of the sea; (3) its nearness to the sea; (4) the slope of the country; (5) the direction of the mountain-chains; (6) the prevailing winds; (7) the nature of the soil; (8) the rainfall; and (9) even the cultivation of the soil.

The climate of a large country like India is of necessity very varied. Its proximity to the equator would lead us to conclude that the climate would be tropical and very warm, but no country of equal extent is so much favoured as India. This arises from the physical inequalities of its surface which prevent the country from being a desert. The Himalayas act as the great modifiers of temperature, and provide proper water supply to the rivers in the north as well as to the atmosphere—*see heads* (5) *and* (8).

Owing to certain causes, the wind, instead of blowing from all quarters, blows generally for six months in one direction and six months in the other. These are 'monsoons,' and on these the rain of India depends. Certain districts in the south of the Deccan, which are exposed to both winds, have two rainy seasons, one for each monsoon. The year in India admits for the most part of being divided into three seasons—namely, the *hot*, the *wet*, and the *temperate*. During the hot season, on the low plains of the coast and in the plain of the Ganges, the heat is almost unbearable, but on the Deccan, owing to its elevation, the heat is much subdued—*see heads* (6), (8), *and* (2). The air of the hills is purer and cooler than that of the plains; and therefore the Europeans who suffer from the climate of the plains betake themselves to the hills to recruit their health. The most unhealthy districts are those in which there is swamp or jungle—*see head* (9)—such as the Terai, the Sunderbunds, and some of the rice grounds on the eastern coast.

The climate of Cape Colony is mild and healthy, being situated in the northern half of the S. temperate zone. It is very dry, and remarkably free from epidemic diseases. The rainfall at Cape Town is considerable, but the interior and W. coast are almost without parallel for dryness. In the Great Karroo no rain falls sometimes for three years in succession. Snow falls only on the mountains, the highest peaks of which are covered by it for six months in the year.

3. What are the productions of Malta, New Zealand, and Ceylon? Show how far the climate of each country is suitable for its productions.

Malta, besides producing grain and fruits common to temperate regions, also grows, on account of its warm and delightful climate, not a few tropical products, such as the cotton-plant, sugar-cane, papyrus, date-palm, figs, blood-red oranges, vines, and olives.

New Zealand, from its position on the globe, has a mild and equable climate, and the North Island revels in perpetual spring. The forests of the country are rendered very beautiful by the luxuriant green of the tree-ferns, which are fostered by the warm moisture of the west coast. The country produces grain of all kinds, fruits, and vegetables common to temperate regions. The Kauri pine is the most famous of New Zealand trees, and the New Zealand flax has fibres which make a cordage of great tenacity and strength.

Ceylon has a very hot and moist climate, and hence its vegetation is highly luxuriant. The most valuable trees are the cinnamon-tree, the cocoa, the Palmyra palm, the tallipot, tamarind, and bread-fruit tree. Rice, cotton, pepper, tobacco, cotton, coffee, sugar-cane, indigo, and various other vegetables are raised.

SECOND PAPER.

Two hours and a half allowed.

History.

1. Give the names and parentage of the sovereigns who were reigning in the years 1155, 1217, 1400, 1486, and 1560.

Year	Sovereign.	Father.	Mother.
1155	Henry II.	Geoffry of Anjou.	Matilda, daughter of Henry I.
1217	Henry III.	King John.	Isabel of Angoulême.
1400	Henry IV.	John of Gaunt.	Blanche of Lancaster.
1486	Henry VII.	Edmund Tudor, Earl of Richmond.	Margaret Beaufort.
1560	Elizabeth.	Henry VIII.	Anne Boleyn.

2. What can you tell about the reduction of Wales?

In 1276 Edward I., in pursuit of his determination to reduce the whole island under one dominion, had turned his arms against Wales. Llewellyn, Prince of Wales, refused to come before the English king and do homage. He was declared to be a rebel, and Edward invaded his country in 1277. The English troops, in irresistible force, hemmed in Llewellyn and his Welshmen in the mountainous district of Snowdon, and forced them by famine to submit. Llewellyn did homage at Westminster, and agreed to pay an annual tribute. Peace was for a time kept, but in 1281 the Welsh patriots rose in arms, and Edward again invaded their country in great force. In 1282 the struggle virtually ended with the defeat and death of the Welsh prince, whose head was set up at the Tower of London. His brother David, who maintained a desultory struggle for independence, was betrayed to Edward, and his head was set up beside his brother's. In 1283 Wales was thus brought under English rule.

3. How came kings of England to hold large possessions in France? How were those possessions lost?

William I., as Duke, possessed Normandy; and by right of conquest and possession William II. held Maine and Normandy. Henry I. possessed the dukedom, but it was lost during the reign of Stephen. Henry II. held a great extent of French territory, but under the weak and vacillating King John none remained to him and his successor Henry III. but Guienne and Poitou. Edward I. lost Guienne, which Edward III. recovered by the treaty of Bretigny. Henry V. held possession of the north of France as far as the Loire, and the same for a time remained with Henry VI.; but under this imbecile king everything was lost except Calais, which continued an English possession till the reign of Mary.

Teaching.

Give some examples of the kind of exercises in Mental Arithmetic which you would use in Standard I.

As it is expected that practice in addition, subtraction, and multiplication, with numbers up to 50, and money up to 2s., be given in Standard I., the following exercises might be given:—

Addition:—3 boys + 5 boys + 4 boys, etc.; 13 + 3 + 9 + 4, etc.; 2d. + 3d. + 4d., etc.

Subtraction:—4 apples from 9 apples; 7 balls from 40 balls, etc.; 7 from 11; 5 from 18; 23 from 30, etc.; 6d. from 1s., etc.

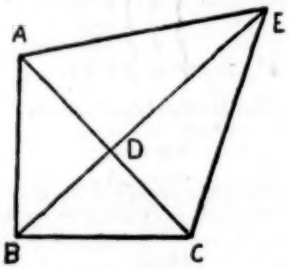
Multiplication:—3 times 4; 4 times 5; 6 times 3, or 3 times 6, etc. 4 apples to each of 3 boys, how many? 3d. to each of 5 boys, how much left from 2s.? I go to the shop and buy two loaves at 3½d. each, what remains out of 1 shilling? etc., etc.

Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

1. On AC, the hypothenuse of an isosceles right-angled triangle ABC, is described an equilateral triangle, ACE, and BE cuts AC at D. Show that AD, DC are equal.



AE = EC, AB = BC (Hyp.), and BE is common to the two △s. AEB, CEB, then (I. 8) ∠AEB = ∠CEB.

Again, the two sides AE, ED = the two sides CE, ED and the ∠AED = ∠CED, ∴ (I. 4) the base AD = the base DC.

Q. E. D.

2. From the given point P, to draw a straight line equal to the given straight line QR.

Prop. 2, Bk. I.

3. Any two sides of the triangle LMN are together greater than the third side.

Prop. 20, Bk. I.

Needlework.

FEMALE CANDIDATES.

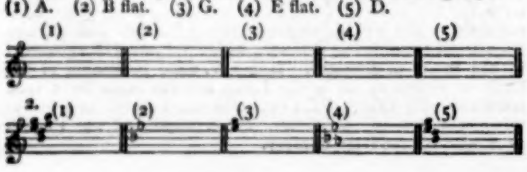
One hour allowed for this exercise.

Music.

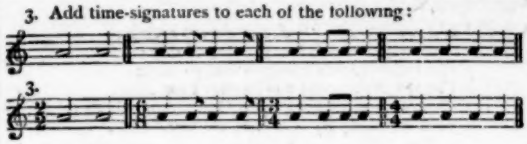
A quarter of an hour allowed for this paper.

1. Write below each of the following intervals its name (minor third, &c.):

2. Write the key-signature of each of the following keys:—(1) A. (2) B flat. (3) G. (4) E flat. (5) D.



3. Add time-signatures to each of the following:



TONIC SOL-FA NOTATION.

1. What is the interval (major third, &c.) (*a*) between *ray* and *fah*, (*b*) between *soh* and *doh'*, (*c*) between *doh* and *fah*, (*d*) between *doh* and *lah*, (*e*) between *doh* and *me*?

1. (*a*) Minor third. (*b*) Perfect fourth. (*c*) Perfect fourth. (*d*) Major sixth. (*e*) Major third.

2. Which are the (*a*) strong tones of the scale, and (*b*) which are the leaning tones?

2. (*a*) *Do, me, soh*; (*b*) *ray, fah, lah, te.*

3. Write (*a*) a four pulse measure, (*b*) a six-pulse measure, (*c*) and a nine-pulse measure, all in primary form.

3. (*a*) | : | : ‖ (*b*) | : : | : : ‖

(*c*) | : : | : : | : : ‖

THIRD YEAR.

Pupil Teachers at end of Third Year, *if apprenticed on, or after,* **1st *May,* 1878; and Pupil Teachers at end of Fourth Year,** *if apprenticed before that date.*

Three hours and a half allowed.

Arithmetic.

MALES.

1. A grocer by selling sugar at 3½d. per lb. loses 2 per cent. on his outlay. What did the sugar cost per cwt.?

Selling price of 1 cwt. = 3½d. × 112 = 392d.

∴ 98 : 100 :: 392d. : cost per cwt.

$\frac{392 \times 100}{98} = 400\text{d.} = £1\ 13\text{s. } 4\text{d.}$ Ans.

2. Find the square root of ⅓ to 4 decimal places; and show that $\sqrt{1\frac{33}{144}} = 1{\cdot}083$.

(*a*) ⅓ = ·3

```
 | ·33333333 ... (·5773. Ans.
 | 25
107 | 833
     | 749
1147 | 8433
     | 8029
11543 | 40433
      | 34629
        5804
        ....
```

(*b*) $\sqrt{1\frac{33}{144}} = \sqrt{\frac{169}{144}}$

,, = $\frac{13}{12}$

,, = 1·083 Q. E. D.

3. A man has £16,500 worth of stock in the 3 per Cents., and he sells out at 101½, and re-invests the proceeds in 4 per cent. railway debentures at 131⅛. Find the increase in his income, a brokerage of ⅛ per cent. being charged on each transaction.

(131⅛ + ⅛) : (101½ − ⅛) :: £16,500 : stock in railways.

$£\frac{16,500 \times 101}{132} = £12,625$

£

2nd income = $£\frac{12,625 \times 4}{100} = 505$

1st ,, = $£\frac{16,500 \times 3}{100} = 495$

Increase of income 10. Ans.

4. If the true discount on a bill of £731 10s. due twelve months hence be £31 10s., find the rate of interest.

Present value of bill = £700;

$\therefore$ 700 : 100 : : £31½ : rate.

$\frac{63 \times 100}{2 \times 700} = 4\frac{1}{2}$. Ans.

FEMALES.

1. Divide 7·619 by ·0019, and multiply the quotient by $\frac{3}{23}$ of ·00011569.

(*a*)

·0019)7·619(4010

76

(*b*)

$\frac{3}{23}$ of ·00011569 = $\frac{·00011569 \times 3}{23}$

= ·00000503 × 3

= ·00001509

(*c*)

·00001509

·4010

15090

6036

·0605109. Ans.

2. Divide £20 3s. 5·2d. by ·728.

$\frac{£20\ 3s.\ 5·2d.}{·728} = \frac{4841·2d.}{·728}$

= 6650d. = £27 14s. 2d. Ans.

3. Divide 50 into two parts, such that one shall exceed the other by 6·75.

$\frac{50 + 6·75}{2} = \frac{56·75}{2} = 28·375$ the greater. Ans.

$\frac{50 - 6·75}{2} = \frac{43·25}{2} = 21·625$ the less. Ans.

4. If a journey occupies 5 hours, when the average rate of travelling is 28 miles an hour, what was the rate of travelling when it required 14 hours?

14 hrs. : 5 hrs. : : 28 mls. : rate.

$\frac{28 \text{ mls.} \times 5}{14} = 10$ mls. Ans.

Grammar.

1. Others *more* mild,
Retreated in a silent valley, *sing*
With notes angelical to *many a* harp
Their *own* heroic deeds, and hapless *fall*
By doom of battle, and complain *that Fate*
Free *virtue* should *inthrall to* force or chance.

Paraphrase this passage.

2. Analyse the noun sentence in it, and parse the words in italics.

3. Point out in the foregoing lines—

(*a*) Words with English roots.
(*b*) Any Latin prefix.
(*c*) Any Latin affix.
(*d*) Any English affix.

1. PARAPHRASE.

Those of a gentler disposition withdraw into a secluded spot, and with angel tones to the accompaniment of harps they chant the story of their bravery displayed in that disastrous fight which decided their fortune. They lament that the virtuous, who should be untrammelled, are destined to be the slaves of those who happen to get power over them.

2. ANALYSIS.

That.....Connective.
Fate.....Subject.
should inthrall .....Predicate.
free virtue .....Object (direct).
to force or chance .... ,, (indirect).

PARSING.

more—adv. of degree mod. 'mild.'
retreated—complete part of reg. verb 'to retreat,' predic. of 'others.'
sing—irreg. trans. (=sing. of) verb, *sing, sang, sung*, indic. pres. indef., 3rd pers. plur., agr. with 'others.'
many—(=adv. mod. 'a').
many a—adj. phrase qual. 'harp.'
own—adj. emphasizing 'their,' and with 'their' forming a poss. adj. qual. 'deeds.'
fall—abst. noun, neut., sing., obj., gov. by 'sing.'
that—subord. conj. introd. noun sent., 'Fate free virtue . . . chance.'
Fate—abst. noun, personified, fem., sing., nom., subj. of 'should inthrall.'
virtue—abst. noun, neut., sing., obj., gov. by 'should inthrall.'
inthrall—reg. trans. verb, infin., pres., gov. by 'should.'
to—prep., gov. obj. case 'force' and 'chance.'

3. (*a*) Words with English roots:—deeds, hapless, doom, inthrall.
(*b*) With Latin prefix:—re- (retreated); com- (complain); in- (inthrall).
(*c*) With Latin affix:— -al (angelical); -ic (heroic).
(*d*) With English:— -ed (retreated); -less (hapless).

Geography.

Answer either Q. 1 or Q. 3; not both.

1. Give full notes of a lesson on 'The Caspian Sea; its Character, Rivers, Towns, and surrounding Mountains.'

Draw a map in illustration of your answer.

CHARACTER.—A vast salt-water lake—largest strictly inland expanse of water in the world—called a 'sea' by the ancients, who thought it a part of the Northern Ocean—remarkable from its surface being below the general level of the waters of the globe, and having no outlet.

The Caspian Sea *has no tides*—waters are moderately salt—it is shallow—stormy—of difficult navigation—and has a few indifferent ports.

RIVERS.—Principal rivers running into it—the *Volga* (2,200 miles), longest of European rivers; the *Ural* (1,150 miles), *Terek* (300 miles), *Kour* (550 miles), and the *Atrek*.

TOWNS.—*Astrakhan*, at the mouth of the Volga, a thriving commercial town—manufactures of cotton, silk, leather—great entrepôt between Russia, Persia, and India. *Derbend*, a place of great strength and importance, being situated at the entrance of a defile in the Caucasus, (Albanian Gates). *Baku* has the best harbour on the W. side of the Caspian, exports naphtha and salt. *Astrabad* (Persia), admirably situated for commerce, but has little trade—very unhealthy. *Resht*, a well-built town, with extensive bazaars.

MOUNTAINS.—The *Caucasus* chain, the loftiest in Europe, extends from C. Aspheron, in the Caspian, to the peninsula of Taman, between the Black Sea and the Sea of Azov, being a distance of 750 miles. They separate Europe from Asia, and the basins of the Kuban and Terek from those of the Kur and Rion. Highest summit, Mt. Elburz, 18,571 ft. The *Elburz* range, S. of the Caspian, Mt. Demavend, and Zagros, or Mts. of Kurdistan, separate the basins of the Euphrates and Caspian.

2. What are the causes which affect climate? Illustrate your answer by reference to British India and Cape Colony.

See Geog. of Second Year.

3. Describe the chief currents of the Atlantic Ocean.

In the Atlantic a great equatorial current starts from St. Thomas, on the coast of Africa, and runs westward towards the shoulder of S. America. Before arriving there it throws off a branch to the south, which goes along down the coast of Brazil to the southern end of S. America, and there turns eastward towards the Cape of Good Hope. The main stream, however, is very much more important. It runs nearly due west about 350 miles wide, and at a rate of from 20 to 50 miles a day. It sweeps past the coast of S. America, passes through the Windward Islands, across the Caribbean Sea, and into the Gulf of Mexico. As the current sweeps round the gulf it becomes very hot, and is swollen by the waters of the Mississippi, till at length it forces its way out into the Atlantic between Florida and Cuba, in a stream of from 30 to 40 miles wide and 600 or 700 feet deep, and at a speed of about 80 miles a day. At first it keeps pretty

close to the coast of America, but by degrees widens out, and bears away to the east, running between Newfoundland and the Azores. There it parts. The main body turns round the Azores, and goes off southwards between those islands and Spain down to the African coast. The other portion runs on northward between Britain and Iceland, giving warmth and moisture to Cornwall, Ireland, the Hebrides, and the Shetland Islands. The northward motion of the Gulf Stream, as the current is called, necessitates a southward motion from the Polar Seas. Immediately beneath the Gulf Stream, and on the inner or land side of it, runs a current of cold water past Labrador to replace the warm water brought up from the tropics.

SECOND PAPER.

Two hours and a half allowed.

History.

1. Explain the contentions which arose between Charles I. and his first three parliaments.

The chief question at issue between Charles I. and his parliament was whether the money for the expenses of the government should be raised by the will of the King or of the people. The King believed in his Divine right to do as he pleased, and the parliament insisted on holding and exercising powers inherited from past ages. Obstinacy and faithlessness on the part of the King, and bitter feeling and determined purpose on the part of the Commons, at last brought the dispute to such a pass that war alone could settle it.

In the first parliament the Commons would grant tonnage and poundage for one year instead of for life; in the second they would grant no supplies but on redress of grievances, and proceeded to impeach Buckingham for misdemeanours as chief adviser of the Crown; and in the third the House of Lords joined with the Commons in drawing up and presenting to the King the famous Petition of Right. After an evasive reply, Charles was forced to sign the petition, and when the Commons proceeded to attack Buckingham Parliament was suddenly prorogued.

2. Name the wives and children of James II.

James II., by his first wife, *Anne Hyde*, daughter of Lord Clarendon, had two daughters, *Mary II.* and *Anne*.

By his second wife, *Mary d'Este of Modena*, he had one son, *James*, the 'Old Pretender.'

3. Write a biographical sketch of Queen Victoria.

Queen Victoria is the daughter of the Duke of Kent, the fourth son of George III. Her mother was the Princess of Leiningen. The Queen was born in Kensington Palace on the 24th of May, 1819. Her father died when she was very young, and the widowed mother was assisted in the training of the Princess by Prince Leopold. On the death of her uncle, William IV., 1837, she succeeded to the throne at the age of eighteen, and was crowned on the 28th June, 1838. On the 10th February, 1840, Her Majesty married her cousin, Prince Albert, of Saxe-Coburg and Gotha. The Prince Consort, whose public and private conduct gained him the respect of the whole nation, died in 1861. The children of the Queen are four sons—Albert Edward, Prince of Wales; Alfred, Duke of Edinburgh; Arthur, Duke of Connaught; Leopold, Duke of Albany; five daughters—Victoria, Princess Royal; Alice (dead); Helena; Louise; Beatrice.

Of the Queen it has been said that she is the happiest, most stainless, and most popular of English Queens, against whom no sedition has ever risen, nor evil whisper has ever been breathed, and who could at any time of her long reign, even when crowns were falling around her, and all the demons of revolution raging, have passed unattended from one end of her country to the other, secure of universal homage and honour, and loyalty, and devotion. It is doubtful whether as much could be said of any other monarch who has ever reigned.

Teaching.

Sketch out notes of a lesson on 'Glass; its Manufacture and Uses.'

NOTES 'ON GLASS.'

Objects to be Shown to Class.—Pieces of as many kinds of glass as possible—emery powder—sand—potash—lime—saltpetre—flint—iron rust.

How Glass is Made.—Sand and soda or potashes, melted together in an earthenware pot at a very strong heat, to make common or window glass. For *Crown* glass some saltpetre and lime are added; for *Plate* glass saltpetre sometimes left out. These materials used in different proportions by different manufacturers.

How Glass is Shaped.—All materials being melted to a paste, an iron tube is put into it, and the lump which sticks to the end is blown into the shape of a bubble; part opposite the end of blow-pipe is opened, and by a quick, whirling motion the hole opens, and the bubble becomes a round, flat sheet. Sometimes another plan is taken instead of the above: the molten glass is blown into the inside of a metal cylinder, and then, while still hot, cut and flattened down. (*Show with a piece of paper rolled into the form of cylinder.*)

Plate glass is made by pouring the molten mass on to a smooth metal table, and rolling it out evenly with a metal roller. It is then cooled very slowly to prevent its becoming brittle; ground with water and emery, and polished with water and iron-rust; finished by rubbing two plates together.

Uses.—Windows, roofs (description of Crystal Palace), bottles, glasses, decanters, spectacles, telescopes and microscopes (great care is taken in the making of lenses for these), mirrors (glass covered with an alloy of mercury and tin); church windows made of beautifully stained glass.

Euclid.

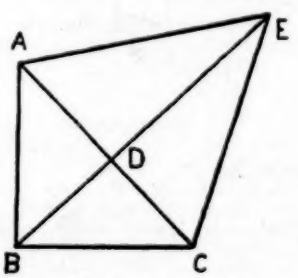
MALES.

Answer two questions, including Question 1, if possible.

[All generally understood abbreviations for *words* may be used.]

1. On AC, the hypothenuse of an isosceles right-angled triangle ABC, is described an equilateral triangle ACE, and BE cuts AC at D.

Show that the square on DE is three times the square on BD.



By construction AB = BC, and ∴ in the △s ABE, EBC, the two sides AB, BE = CB, BE, and the base AE = the base CE; ∴ (I. 8) ∠ ABE = ∠ EBC, and hence each is ½ right angle. But (constr.) ∠ BAC = ∠ BCA = ½ right angle.

It ∴ follows that the angles at D are right angles, and that AD = DB = DC.

Now (I. 47) $DE^2 + DB^2$ (for DB = AD) $= AC^2$ (for AC = AE)
$= AB^2 + BC^2$
$= AD^2 + DC^2 + 2\ DB^2$
i.e., $DE^2 + DB^2 = 4\ DB^2$
take away DB^2 and $DE^2 = 3\ DB^2$. Q. E. D.

2. To draw a straight line through a given point parallel to a given straight line.

Prop. 31, Bk. I.

3. Let the parallelogram ABCD and the triangle EBC be on the same base BC and between the same parallels BC, AE. Then shall the parallelogram ABCD be double of the triangle EBC.

Prop. 41, Bk. I.

Algebra.

MALES.

Answer two questions.

1. Show that

$$(a+b)^4+(a-b)^4+4(a^2-b^2)\left\{(a+b)^2+(a-b)^2+\frac{3(a^2-b^2)}{2}\right\}=16a^4$$

(1) $(a+b)^4 = a^4+4a^3b+6a^2b^2+4ab^3+b^4$

(2) $(a-b)^4 = a^4-4a^3b+6a^2b^2-4ab^3+b^4$

$2a^4 \quad +12a^2b^2 \quad +2b^4$ (1st result)

(3) $4(a^2-b^2)\left\{(a+b)^2+(a-b)^2+\frac{3(a^2-b^2)}{2}\right\} =$

$4(a^2-b^2)\left\{a^2+2ab+b^2+a^2-2ab+b^2+\frac{3a^2-3b^2}{2}\right\} =$

$2(a^2-b^2)\{4a^2+4b^2+3a^2-3b^2\} =$

$(2a^2-2b^2)(7a^2+b^2) = 14a^4-12a^2b^2-2b^4$ (2nd result)

The addition of 1st result to 2nd = $\underline{16a^4}$. Ans.

2. Show that $\frac{3x+y}{6x^2+xy-y^2}-\frac{3x-y}{6x^2+5xy+y^2}=\frac{12xy}{(2x+y)(9x^2-y^2)}$

(1) $\frac{3x+y}{6x^2+xy-y^2}=\frac{3x+y}{(3x-y)(2x+y)}=\frac{(3x+y)^2}{(3x+y)(3x-y)(2x+y)}$

(2) $\frac{3x-y}{6x^2+5xy+y^2}=\frac{3x-y}{(3x+y)(2x+y)}=\frac{(3x-y)^2}{(3x+y)(3x-y)(2x+y)}$

by subtracting (2) from (1) there remains $\frac{12xy}{(9x^2-y^2)(2x+y)}$

Q. E. D.

3. Solve the equations—

(1) $x-\frac{x-2}{3}=5\frac{1}{2}-\frac{10+x}{5}+\frac{x}{4}$

(2) $x+\frac{1}{x}=\frac{(x+1)(x+2)}{x}$

(1) Clearing of fractions $60x-20x+40=345-120-12x+15x$

$60x-20x+12x-15x=345-120-40$

$37x=185$

$x=\underline{5}$. Ans.

(2) $x+\frac{1}{x}=\frac{(x+1)(x+2)}{x}$

$x^2+1=x^2+3x+2$

$3x=1-2$

$x=-\underline{\frac{1}{3}}$. Ans.

Mensuration.

Answer one question.

1. Find to three decimal places the area of the triangle whose sides are 23, 33, 40.

Area of triangle $=\sqrt{48\times25\times15\times8}$

" $=\sqrt{144000}$

$=\underline{379{\cdot}473}\ldots$ Ans.

2. Find the side of a square which contains 7,367 square feet 52 inches.

Side of square $=\sqrt{1060900}$ sq. inches

$=1030$ lineal inches

$=\underline{85 \text{ ft. } 10 \text{ in.}}$ Ans.

Needlework.

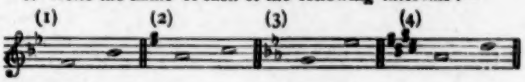
FEMALES.

One hour allowed for this exercise.

Music.

A quarter of an hour allowed for this paper.

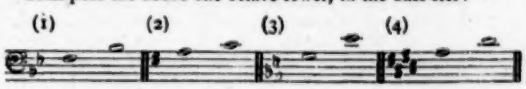
1. Write the name of each of the following intervals :—



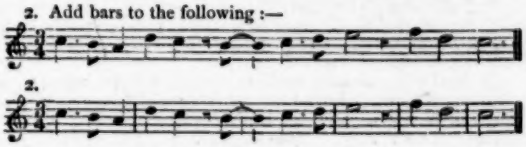
1. (1) (2) (3) (4)

Perfect 4th. Minor 3rd. Minor 6th. Pluperfect 4th.

Transpose the above one octave lower, in the bass clef :—



2. Add bars to the following :—



2.

3. Explain the following terms : (*a*) *Largo.* (*b*) *Vivace.* (*c*) *Rallentando.*

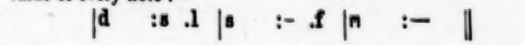
3. (*a*) Broad. (*b*) Lively. (*c*) Slackening (the pace).

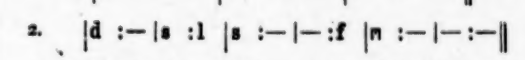
TONIC SOL-FA NOTATION.

1. What is the interval (*a*) between *doh* and *fah*, (*b*) between *ray* and *fah*, (*c*) between *me* and *doh*¹, (*d*) between *fah* and *te*? What is the name (*e*) for *fah sharp*, (*f*) for *te flat*, (*g*) for *soh sharp*?

1. (*a*) Perfect fourth. (*b*) Minor third. (*c*) Minor sixth. (*d*) Pluperfect fourth. (*e*) *Fe.* (*f*) *Ta.* (*g*) *Se.*

2. Re-write the following in four-pulse measure, doubling the value of every note :—



2. 

3. Explain the following terms :—(*a*) *Largo.* (*b*) *Vivace.* (*c*) *Rallentando.*

3. (*a*) Broad. (*b*) Lively. (*c*) Slackening (the pace).

FOURTH YEAR.

Pupil Teachers at end of Fourth Year, *if apprenticed on, or after,* **1st May, 1878; and Pupil Teachers at end of Fifth Year,** *if apprenticed before that date.*

Three hours and a half allowed.

Arithmetic.

MALES.

1. At what price should I buy 5 per cent. railway debentures in order that I may get 4 per cent. for my money, brokerage being $\frac{1}{4}$ per cent. ?

4 : 5 :: 100 : 125 price of stock including brokerage,

∴ buying price should be $\underline{124\frac{1}{4}}$. Ans.

2. Show that every vulgar fraction can be converted into a terminating or a recurring or circulating decimal. What must be the form of the denominator of the vulgar fraction in order that it may be convertible into a terminating decimal ?

Ex. Explain without actual division which of the following fractions will give terminating decimals :—$\frac{9}{25}$, $\frac{7}{12}$, $\frac{7}{75}$.

Any fraction to be expressed as a decimal should first be reduced to its lowest terms, and then, if the denominator contain only powers of 2 and 5 as factors, it may be reduced to a terminating decimal.

For, in reducing a fraction to a decimal we annex ciphers to the numerator, and divide by the denominator; and since the annexing of ciphers is equivalent to multiplying by 10, or 2×5, therefore the denominator, in order to be contained exactly in same power of 10, must be made up only of 2 and 5 as factors. In this case, then, the division must terminate, but not so if the denominator contain any other factors, as 3, 7, 11, etc., since no power of 10 whatever would contain the denominator.

Again, if the denominator in its lowest terms contain any other factor than powers of 2 and 5, the fraction may be expressed as a circulating decimal where the number of the figures in the period will be less than the denominator.

For since in the division the figures to be taken down are always the same, namely, ciphers, it follows that whenever we have any former remainder repeated, we shall always have the same series of figures repeated in the quotient; but if we go far enough, we cannot help having some former remainder repeated, for all the remainders must, of course, be less than the divisor, that is, the denominator, and so the number of different remainders must be less than the denominator itself.

Ex. Since $25 = 5 \times 5$, and $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$, then $\frac{3}{25}$ and $\frac{5}{64}$ will give terminating decimals; and since $75 = 5 \times 5 \times 3$, then $\frac{7}{75}$ will give a recurring decimal.

3. A can do a piece of work in 8 days, B in 10 days, and C in 12 days respectively. After A has worked 3 days, and B 4 days, in what time can C finish the work?

A does $\frac{1}{8}$ in 1 day and $\frac{3}{8}$ in 3 days;
B ,, $\frac{1}{10}$,, $\frac{2}{5}$,, 4 ,,
$\therefore$ A and B do $\frac{3}{8} + \frac{2}{5}$, or $\frac{31}{40}$ of the work.
Now, since C does $\frac{1}{12}$ in one day, he will finish the remaining $\frac{9}{40}$ in $(\frac{9}{40} \div \frac{1}{12})$ days, or $2\frac{7}{10}$ days. Ans.

4. A person invests a certain sum in the 3 per cents. at $98\frac{3}{4}$, and sells out at $101\frac{1}{4}$. If he gains by the transaction £170, what sum did he invest? (Brokerage being charged at $\frac{1}{8}$ per cent. in each case.)

£
In selling out he gets 101
for what he paid $98\frac{3}{4}$
$\therefore$ gain on $98\frac{3}{4}$ = $2\frac{1}{4}$
$\therefore 2\frac{1}{4} : 170 :: £98\frac{3}{4} : ?$

$$\frac{£791 \times 170 \times 8}{8 \times 17} = £7910.$$ Ans.

FEMALES.

1. Find the amount of £750 lent on March 29th, and repaid August 28th, at 5 per cent.

No. of days from 29th March to 28th Aug. $= 2 + 30 + 31 + 30 + 31 + 28 = 152$ days.

$\therefore$ Interest $= £750 + \frac{1}{365} \times \frac{5}{100} \times 152$
$= £\frac{1}{1}\frac{5}{4}\frac{0}{6} = £15$ 12s. $3\frac{3}{73}$d.
Amount $= £750 + £15$ 12s. $3\frac{3}{73}$d. $= £765$ 12s. $3\frac{3}{73}$d. Ans.

2. Divide £17 6s. 3d. into parts in the ratio of 2, 5, 8.

$2 + 5 + 8 = 15$
1st part $= \frac{2}{15}$
2nd ,, $= \frac{5}{15}$
3rd ,, $= \frac{8}{15}$
of £17 6s. 3d. $=$

£	s.	d.	
2	6	2.	Ans.
5	15	5.	Ans.
9	4	8.	Ans.

3. If $93\frac{1}{8}$ yards are walked in $\frac{3}{4}$ min., how long will be required for $\frac{5}{8}$ of a mile at the same rate?

$93\frac{1}{8}$ yds. : $\frac{5}{8}$ of 1760 yds. :: $\frac{3}{4}$ min. : ?

$$\frac{21 \text{ min.} \times 2 \times 1760 \times 15}{25 \times 35 \times 1408} = \frac{9}{10} \text{ min.} = 54 \text{ sec.}$$ Ans.

4. By selling 7 cwt. 2 qrs. of sugar at $5\frac{1}{2}$d. per lb. a grocer makes a profit of 32 per cent. What did it cost him per cwt.?

Selling price of 1 cwt. $= 5\frac{1}{2}$d. $\times 112 = 616$d.
$\therefore 132 : 100 :: 616$d. : cost of 1 cwt.

$$\frac{616\text{d.} \times 100}{132} = 466\tfrac{2}{3}\text{d.} = £1\ 18\text{s.}\ 10\tfrac{2}{3}\text{d.}$$ Ans.

5. If £7334 19s. 9d. be invested in 5 per cents. at $102\frac{1}{2}$, what income will be obtained?

$£102\frac{1}{2} : £7334$ 19s. 9d. :: £5 : income.

$$\frac{£7334\ 19\text{s.}\ 9\text{d.} \times 5 \times 8}{823} = £356\ 10\text{s.}$$ Ans.

Grammar.

1. 'But *say* I *could* repent, and could *obtain*
By act of grace my *former* state, *how* soon
Would highth recall high thoughts, how soon *unsay*
What feigned submission swore! Ease would recant
Vows *made* in pain *as* violent and *void*;
For never *can* true reconcilement grow
Where wounds of deadly hate have pierced so *deep*.'

Analyse the first five lines of this passage.

2. Parse the words in italics.

3. Comment on the meaning and source of the prefixes 're,' 'ob,' 'sub,' and 'un,' and the affixes 'th,' 'ment,' and 'ly,' in the above passage.

4. Instance from it—
(*a*) Words of English origin.
(*b*) Words coming directly from the Latin.
(*c*) Any words coming from the Latin through Norman-French.

ANALYSIS.

Sentence.	Kind.	Subject.	Predicate.	Object.	Extensions.
1. say (you)	Principal	(you)	say	(*sentences 2 and 3*)	
2. (that) I could repent,	Subord. noun object to 1.	I	could repent		
3. and (that) I could obtain by act of grace my former state.	Subord. noun object to 1.	(and) I	could obtain	my former state	by act of grace (*means*)
4. But how soon would highth recall high thoughts.	Principal	highth	would recall	high thoughts	how soon (*time*)
5. How soon (would highth) unsay	Principal	(highth)	(would) unsay	(*sentence 6*)	how soon (*time*)
6. what feigned submission swore!	Subord. noun object to 5.	feigned submission	swore	what	
7. Ease would recant vows made in pain as violent and void.	Principal	ease	would recant	vows made in pain	as violent and void (*reason*)

2. PARSING.

Say—irreg. trans. verb, *say, said, said*, imper., 2nd pers., agr. with (you).
Note.—The power of this word is equivalent to the conditional conjunction 'if.'
could—defect. intrans. verb, *can, could*, indic., past. indef., 1st pers., sing., agr. with 'I.'
obtain—reg. trans. verb, infin., pres. indef., gov. by 'could.'
former—adj., comp. deg., qual. 'state' (used as a dist. adj. in apposition with 'latter').
how—interrog. adv. of degree, mod. 'soon.'
unsay—irreg. trans. verb, *unsay, unsaid, unsaid*, infin., pres. indef., gov. by 'would.'
what—rel. pron., antecedent suppressed, neut., sing., obj., gov. by 'swore.'
feigned—complete part of irreg. verb 'to feign,' qual. 'submission.'
made—complete part. of irreg. verb *make, made, made*, predic. of 'pain.'
as—subord. conj., mod. 'would recant.'
void—predic. adj., qual. 'vows.'
can—defect. intrans. verb, *can, could*, indic., pres. indef., 3rd pers., sing., agr. with 'reconcilement.'
deep—adv., mod. 'pierced.'

3. *Re* in repent, recant, recall, and reconcilement is derived from the Latin, and means 'back,' 'again,' or a reversal of the meaning of the root.

Ob in obtain is also of Latin origin, and means 'to' or 'towards.'

Sub, also from the Latin, means 'under,' as in 'submission.'

Un is from the Anglo-Saxon, and means 'not,' or a reversal of the root meaning as 'unsay.'

The affix 'th' makes nouns out of adjectives, as 'highth' from 'high,' and is English.

Ment is Latin, and forms nouns from verbs, as 'reconcilement,' from 'reconcile.'

Ly in 'deadly' is Anglo-Saxon, and forms adverbs from adjectives, meaning 'like,' as 'deadly.'

4. (*a*) Words of English origin are :—'But,' 'could,' 'would,' 'how,' 'highth,' 'unsay,' 'what,' etc.

(*b*) From the Latin come 'submission,' 'recant,' 'violent,' 'reconcilement.'

(*c*) From the Latin through French we have 'repent,' 'grace,' 'obtain,' 'feigned.'

Geography.

Answer either Q. 1 or Q. 3; not both.

1. Give notes of a lesson on 'The Distribution of Land and Water on the Face of the Earth.'

APPARATUS :—*Terrestrial Globe—Map of the World—Maps showing Sea and Land Hemispheres.*

PROPORTIONS OF LAND AND WATER.—Surface of earth consists of land and water; water-area exceeds land-area (*draw this out by reference to globe and map*); surface of earth is 197 millions of square miles, of which 52 millions are dry land, and the remaining 145 millions water (*make a diagram on B.B., showing approximate proportions*); land very unequally arranged, being collected together much more to the north than to the south, and to the east than to the west (*refer to map and globe*); London very nearly in the centre of this mass of land; New Zealand almost in the centre of the ocean hemisphere; most of the land lies north of the equator, most water to the south (*draw these facts from the class*).

LAND.—Land arranged in two great masses (*show E. and W. hemispheres*), lying nearly opposite each other on the globe; Old World; New World; (*explain why*) both worlds broad in the north; Old World runs across the globe; New World runs north and south; (*contrast the two worlds, showing that they are cut midway by the sea, thus forming six distinct masses of land, called continents*); Asia, Europe, N. America are the northern continents; Australia, Africa, S. America the southern (*compare the sizes of these*).

WATER.—The great body of water is undivided; but the sea naturally divides itself on the map into five main portions—Atlantic, Pacific, Indian, Arctic, and Antarctic Oceans. (*Let the scholars read these on map or globe, and compare the sizes of the oceans.*)

2. Draw a full map of the United States of America. Insert the lines of latitude and longitude.

3. Describe an eclipse of the moon; and say how it affords a proof that the world is round.

The moon, in common with all the planets and satellites, shines by reflected light derived from the sun. When the sun, the earth, and the moon are in the same line, the earth will intercept the rays of the sun, and *cast a shadow* on the moon, thereby causing an eclipse of the moon. Such eclipses never happen but at the exact time of full moon. Her orbit is inclined to that of the earth at an angle of 5° 9′, but for which we should have an eclipse of the sun and moon alternately every fortnight.

Again, this shadow, which is plainly seen to enter upon and eat away, as it were, the moon's disc, is always terminated by a circular outline, though from the greater size of the circle it is only partially seen at any one time. Now a body which always casts a circular shadow must itself be spherical. This fact is therefore a convincing proof that the world is round.

SECOND PAPER.

Two hours and a half allowed.

History.

1. What plots disturbed the reign of James I.? How do you account for them?

Immediately after the coronation of James I. a conspiracy was formed in favour of Arabella Stuart, who, as well as James, was descended from Henry VIII. Ignorant of the plot, Arabella was unmolested until eight years after, when she had privately married William Seymour, a descendant of the Duchess of Suffolk. This union of two possible pretenders gave alarm, and Arabella was arbitrarily shut up in the Tower, where she became insane, and died.

The Roman Catholics, who had been led to hope for some indulgence from James, were embittered by a proclamation banishing their priests. For this a fearful vengeance—called, from the method employed, the *Gunpowder Plot*—was devised. Robert Catesby proposed to a few trusty friends to blow up the Parliament House with gunpowder on the day the king was to open the session. Before the scheme was complete James had the laws against Popish recusants enforced in all their harshness, and this spurred on the plotters. The plot, however, was discovered 5th November, 1805, and fearful retribution followed the conspiracy.

2. What caused the Irish rebellion of 1641?

The fall of Strafford had put an end to all semblance of rule in Ireland. The disbanded soldiers of the army he had raised spread over the country and stirred the smouldering disaffection into a flame. A conspiracy, organised with great secrecy, burst forth in Ulster, where the confiscation of the Settlement had never been forgiven, and spread rapidly over the centre and west of the island. The new feature of the revolt, beside the massacre with which it opened, was its religious character. It was no longer Celt against Saxon, but Catholic against Protestant. The rebels caused greater panic when they declared that they were fighting for the king, and showed a forged commission, purporting to have been issued by royal command at Edinburgh, and they styled themselves 'the king's army.'

3. What is meant by the Reformation of the Calendar? When did this take place?

In 1751 a statute for the reform of the Calendar was passed. The Julian Calendar made the year too long at the rate of nearly three days in four hundred years. In the 16th century the error had been corrected under a regulation of Pope Gregory XIII., and the alteration had been accepted by most Christian countries. But in the British dominions people still went on with the old style, until at length the day they called the *first* of the month was in other lands the *twelfth*—that is, they were eleven days wrong in their reckoning. By the statute of 1751 these nominal days were dropped out of the month of September, 1752, and the new style was adopted. By the same statute the legal year was reckoned from the 1st January, instead of beginning, as formerly, on the 25th of March.

Teaching.

Show how you would explain to a class the difference between a Transitive and an Intransitive Verb, and give some examples.

Let such phrases as the following be written on the blackboard :—'Tom struck'; 'James cut'; 'the dog bit'; and ask the children to complete the meaning by adding nouns or pronouns (the change in the form of pronouns suiting well for showing the object). 'Tom struck *him* (or *the boy*)'; 'James cut *his finger*'; 'the dog bit *her*, *us*, or *them*,' etc.

'Take another series of verbs, such as 'tremble,' 'rave,' 'sing,' 'flow,' etc., and show that these words can be used without any object, as: 'The leaf trembles'; 'the wind raves'; 'the old man talks'; 'the girl sings'; 'the river flows.'

Now explain that 'transitive' means a passing over of the action from the subject to the object; and that 'intransitive' means a confining of the action to the subject.

Show also that some verbs are sometimes transitive and sometimes intransitive, as: To paint a picture, to paint; to drive a horse, to drive; to hear a sound, to hear.

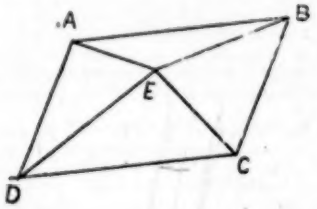
Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

Answer two Questions, including Question 1, *if you can.*

1. The sum of the distances of any point from the angular points of a quadrilateral is greater than half the sum of the sides.



Let E be any point, join EA, EB, EC, ED.

Then, because (I. 20) EA + EB > AB ; EB + EC > BC ; EC + ED > DC ; and ED + EA > AD.

∴ Twice EA + twice EB + twice EC + twice ED are greater than the sides of the quadrilateral, or EA + EC + ED + EA are greater than half the sum of sides of the quadrilateral ABCD.

Q. E. D.

2. Straight lines which are parallel to the same straight line are parallel to each other.

Prop. 31, Bk. I.

3. If a straight line be bisected, and produced to any point ; the rectangle contained by the whole line thus produced, and the part of it produced, together with the square on half the line bisected, is equal to the square on the straight line which is made up of the half and the part produced.

Prop. 6, Bk. II.

Algebra.

MALES.

Answer two Questions.

1. Find the G.C.M. of $x^3-2x^2-15x+36$ and $x^3-4x^2-9x+36$; and show that $\frac{x^3-2x^2-15x+36}{x^3-4x^2-9x+36}=\frac{(x-3)(x+4)}{(x+3)(x-4)}$

$$x^3-2x^2-15x+36\overline{)x^3-4x^2-9x+36}(1$$
$$\underline{x^3-2x^2-15x+36}$$
$$-2x\mid\ -2x^2+6x$$
$$x-3\overline{)x^3-2x^2-15x+36}(x^2+x-12$$
$$\underline{x^3-3x^2}$$
$$x^2-15x$$
$$\underline{x^2-3x}$$
$$-12x+36$$
$$\underline{-12x+36}$$

∴ $\underline{x-3}$ = G.C.M.

$$\frac{x^3-2x^2-15x+36}{x-3}=x^2+x-12$$
$$\frac{x^3-4x^2-9x+36}{x-3}=x^2-x-12$$
$$\therefore \frac{x^3-2x^2-15x+36}{x^3-4x^2-9x+36} \text{ when reduced to lowest terms} = \frac{x^2+x-12}{x^2-x-12}$$
$$=\underline{\frac{(x-3)(x+4)}{(x+3)(x-4)}} \qquad \text{Q. E. D.}$$

2. How many pounds of sugar at $4\frac{1}{2}$d. per lb. must a grocer mix with 110 lbs. at $3\frac{3}{4}$d. in order that he may gain 20 per cent. by selling the whole at 5s. 6d. per stone ?

Prime cost of 1 st. $=\frac{4}{5}$ of 5s. 6d. $=55$d.

∴ Let x = No. of lbs. of sugar,

then $\frac{110+x}{14}$ = No. of stones of mixture,

and 55d. $\left(\frac{110+x}{14}\right)$ represents the value.

$$4\tfrac{1}{2}x+110\times 3\tfrac{3}{4}=55\left(\frac{110+x}{14}\right)$$
$$\frac{33x}{8}+\frac{1650}{4}=\frac{6050+55x}{14}$$
$$231x+23100=24200+220x$$
$$231x-220x=24200-23100$$
$$11x=1100$$
$$x=\underline{100.}\ \text{Ans.}$$

3. Solve the equations :—

$$(1)\ \begin{cases} 200x-201y=50 \\ \frac{x}{10}=\frac{y}{15}=5\cdot1 \end{cases}$$
$$(2)\quad 342x^2-x=1.$$

(1) $\frac{x}{10}-\frac{y}{15}=5\cdot1$ or $3x-2y=153$ or $600x-400y=30600$

$200x-201y=50$ or $\underline{600x-603y=\ 150}$

$203y=30450$

$y=\underline{150.}$ Ans.

Hence $x=\underline{151.}$ Ans.

(2) $342x^2-x=1$

$$x^2-\frac{x}{342}=\tfrac{1}{342}$$
$$x^2-\frac{x}{342}=(\tfrac{1}{684})^2=\tfrac{1}{342}+\frac{1}{684^2}=\frac{2\times684+1}{684^2}=\frac{1369}{684^2}$$
$$x-\tfrac{1}{684}=\pm\tfrac{37}{684}$$
$$x=\tfrac{1}{684}\pm\tfrac{37}{684}$$
$$=\underline{\tfrac{1}{38}}\ \text{or}\ -\underline{\tfrac{1}{36}}.\ \text{Ans.}$$

Mensuration.

MALES.

Answer one Question.

1. The area of an equilateral triangle described on a side of a rectangle is equal to the area of the rectangle ; find the ratio of the sides of the rectangle.

Let x = one side of equilateral triangle, then area of triangle $= x^2\times\frac{\sqrt{3}}{4}$ = area of rectangle.

But x = one side of rectangle,

$\therefore \frac{x^2\sqrt{3}}{4}\div x$ gives the other side, *i.e.* $\frac{x\sqrt{3}}{4}$

Hence one side is to the other as $x : \frac{x\sqrt{3}}{4}$

that is, $4x : x\sqrt{3}$ or $\underline{4 : \sqrt{3}}$

2. Two sides of a parallelogram are 7,584 and 3,937 feet, and a diagonal is 8,545 feet ; determine whether the parallelogram is a rectangle.

By Euclid I. 47, the square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the sides. Here the diagonal corresponds with the hypotenuse.

Now $7584^2+3937^2=73,017,025$,

and $8545^2=73,017,025$,

That is, the square on the diagonal is equal to the square on the other two sides. ∴ (I. 48) the angle is a right-angle, and the parallelogram is a rectangle.

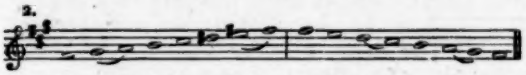
Music.

A quarter of an hour allowed for this paper.

1. Transpose the following one octave higher, into the treble clef, and add bars to it :—

2. Write one octave ascending and descending of any one form of the scale of F sharp minor, using the proper signature.

2.



3. Explain the following terms :—(1) *Adagio.* (2) *Presto.* (3) *Crescendo.* (4) *Rallentando.*

3. (1) Leisurely. (2) Quick. (3) Increasing (in loudness). (4) Slackening (the pace).

TONIC SOL-FA NOTATION.

1. What is the interval (*a*) between *ray* and *se*, (*b*) between *doh* and *se*, (*c*) between *re* and *soh*?

1. (*a*) Pluperfect fourth. (*b*) Augmented fifth. (*c*) Diminished fourth.

2. Write the ascending minor scale in three forms.

2.
(1) Ancient form :— l, t,d r m f s l
(2) Modern form :— l, t,d r m f(s) se l
or (3) ,, ,, l, t,d r m(f) ba(s) se l

3. Explain the following terms :—(*a*) *Adagio.* (*b*) *Presto.* (*c*) *Crescendo.* (*d*) *Rallentando.* (*e*) M. 90.

3. (*a*) Leisurely. (*b*) Quick. (*c*) Increasing (in loudness). (*d*) Slackening (the speed). (*e*) M. 90 means that the pulses of the tune move at the rate of 90 in a minute.

—o—

Recent Inspection Questions.

[*The Editor respectfully solicits contributions—all of which will be regarded as* STRICTLY PRIVATE—*to this column. For obvious reasons, it cannot be stated in which district the questions have been set.*]

Arithmetic.

STANDARD I.

(1) 100+7+81+6+540. Ans. 734.
(2) 800−9. Ans. 791.
(3) 768−59. Ans. 709.

STANDARD II.

(1) 87,690÷11. Ans. 7971, − 9.
(2) 66,309×608. Ans. 40,315,872.
(3) 100,001 − 9909. Ans. 90,092.

STANDARD III.

(1) Divide one million, ten thousand, one hundred and one by 177. Ans. 5706, − 139.

(2) Subtract £80,909 10s. 8d. from the sum of £81, £160, 19 guineas, 3 half-crowns, and £97,658. 19s. 6d. Ans. £17,010 15s. 4d.

(3) A man received half a guinea for his week's work. If he spent a florin, a half-crown, and a crown, how much had he left? Ans. 1s.

(4) Multiply eight hundred and seventy thousand and eight by nine thousand and six.
Ans. 7,835,292,048.

STANDARD IV.

(1) A chest of tea cost 80s. How many ¼ lb. packets could be made from it at 1s. 8d. per lb.?
Ans. 192.

(2) Divide ten hundred thousand pounds and three halfpence by 576. Ans. £1736 2s. 2½d., − 390.

(3) Reduce eighteen million and ninety sq. inches to sq. miles.
Ans. *No* sq. ml. 2 ac. 4208 yds. 8 ft. 90 in.

(4) Multiply the sum of 899 guineas, £1000, one thousand fourpences, 600 florins, 19 farthings by 870.
Ans. £1,757,953 14s. 4½d.

STANDARD V.

(1) A bushel of potatoes cost 8s. 6d. How much would 1 peck 1 gallon cost? Ans. 3s. 2¼d.

(2) Find by practice the cost of 899 at £1089. 12s. 8½d. each. Ans. £979,582 4s. 9½d.

(3) One doz. barrels of herrings, each barrel containing 1000 herrings, and each herring weighing 5 ozs., a £1000 per ton. Ans. £1674 2s. $1\frac{5}{9}$d.

(4) 8½ doz. candles at 9d. per doz. 90 lbs. sugar at 12s. 6d. per stone, 8¾ lbs. cheese at 16d. per lb., 100 lbs. currants at 8d. per lb. Ans. £8 5s. $0\frac{1}{4}$d.

(5) $8\frac{1}{2}+6\frac{5}{8}+6+10\frac{1}{6}+\frac{1}{8}$. Ans. $31\frac{23}{72}$.

STANDARD VI.

(1) ·75 of a guinea + ·19 of £9 + $\frac{5}{8}$ of £1 + ($\frac{3}{7}$ of $\frac{14}{24}$ of $\frac{6}{15}$ of 100d.). Ans. £3 4s. $11\frac{1}{3}$d.

(2) The cost of 10 lbs. for 10 miles is 6s. 8d. What will the cost of 8 lbs. for 12 miles be?
Ans. 6s. $4\frac{4}{5}$d.

(3) $8\frac{9}{10}+\cdot76+\cdot8\dot{5}+\frac{16\frac{1}{2}-7\frac{3}{5}}{8\frac{2}{3}+6\frac{3}{4}}$ Ans. $11\frac{1757}{1831500}$.

(4) Find the amount on £220 at $5\frac{5}{8}$ p. c. for 6 years. Ans. £294 5s.

STANDARD VII.

(1) Find the G.C.M. and L.C.M. of 80, 160, and 22. Ans. 2 and 1760.

(2) A woman loses $\frac{5}{11}$ of her money and has 9s. left. How much had she at first? Ans. 24s.

(3) At what rate per ct. will £202 amount to £268·66 in six yrs. (simple int.)? Ans. $5\frac{1}{2}$ p. ct.

(4) Simplify $\frac{89\div7\frac{2}{3}}{\frac{8\cdot5}{7}\times\frac{1\cdot3}{100}}\div\frac{\frac{8}{10}\text{ of }\frac{2}{10}\text{ of }\frac{1}{100}}{\frac{8}{10}-\frac{1}{6}+\frac{11}{9}}$
Ans. $328\frac{5}{7}\frac{888}{1013}$.

Grammar.

STANDARD IV.

Parse:—How vain some are, how glad to show their clothes and call them rich and new.

STANDARDS V. AND VI.

Analyse.—The cobbler is *very poor, all* his goods *have been sold,* and he says *that* now *his awl is* his *all.* (Parse the words in italics.)

The New Class-Subject, 'Elementary Science.'

(What to teach, and how to teach it.)

BY RICHARD BALCHIN.

I PROPOSE in this article to continue the subject-matter of the short easy lessons to the 'First Standard' as given in the syllabus, which will be found in the February issue of the PRACTICAL TEACHER. Following the lesson on 'Common Wild Flowers,' we have:—

PART IV.

(*a*) 2.—POISONOUS WILD PLANTS.

(Objects exhibited: Pictures or specimens of monk's-hood, deadly nightshade, hemlock, foxglove, hellebore, toadstool, and mushroom, or any other poisonous plant peculiar to the neighbourhood.)

Monk's-hood: flower something like the hood of a monk; a tall plant, three feet; root not unlike a small bunch of radishes; *very* poisonous. Deadly nightshade: in the hedges, flowers not unlike those of the potato-plant; berries when ripe, quite black, very poisonous. Hemlock, a weed, something like parsley when in flower; stem shiny; seeds like little inverted balloons with ridges from top to bottom, and poisonous. Hellebore, known by its most offensive smell. Foxglove, seeds and root poisonous; often found in dells and on the banks sloping down to a brook. Toadstool, poisonous; mushroom, wholesome; both something like umbrellas, with a great number of thin, broad *ribs*. Ribs of toadstool, white; those of mushroom, at first pink, then very dark brown.

Roots of all kinds of buttercups, poisonous.

(*b*) 1.—THE LIME TREE, OR LINDEN.

(Objects exhibited: Leaves of lime, lilac, chestnut, etc. Flowers of the lime, and picture of the tree.)

Distribute leaves; note likenesses and differences. Place lime-tree leaves by themselves. Flowers of the lime, in small clusters on a short stalk which grows from the middle of a sort of leaf, different from the other leaves. Wasps and bees like the flowers. Shape, compared with other trees. Planted by the roadside, grows rapidly, one of the first to come out in the spring; foliage, a bright green; soon changes its colour to yellow, and then to a dingy brown. Wood, soft and weak.

(*b*) 2.—THE FIR.

(Objects exhibited: Small branch of Scotch fir; cones. Piece of pine-wood. Picture of the fir.)

Shape, tall and tapering; compare with picture of oak and elm. Leaves like pins (= pines). Evergreen, *i.e.*, old leaves remain, generally, until the new ones grow. The cones are the fruit. Show on each scale of the cone where the seed is. Fir-trees grow in mountainous countries, *i.e.*, Norway. Wood, very useful; desks, table, cupboards; clean, and easily worked; pretty figure; cheap.

(*b*) 3.—ELM AND CHESTNUT.

(Objects exhibited: Leaves of elm, chestnut, and of some other trees. Flowers and fruit of both horse and eatable chestnut. Pictures of the trees.)

Leaves to be distributed, and differences noted.

(*Note.*—For use in school, I have mounted on a large sheet a variety of leaves that have been properly pressed. It can be used all through the year. The boys in the upper standards make collections of leaves in their exercise books.)

Compare, from pictures, the shapes of elm and chestnut. Elm, tall and stately: a noble tree; often found in rows between fields. Chestnut not so tall; compact, massive. Note the difference between the fruit of horse chestnut and eatable chestnut. The former has rather a smooth, green case; the latter prickly.

(*c*) 1. BEASTS OF BURDEN AND DRAUGHT.

(Objects exhibited: Pictures of horse, mule, camel, reindeer, elephant, ass, ox, dog, etc.)

Horse, camel, elephant, ass; beasts of both burden and draught (pr. draft).

Reindeer, ox, dog; draught only. Note difference between feet of horse, camel, elephant. Show, from pictures, the various countries in which each is found: how each is adapted to the circumstances of its own locality. Mule can pass where the horse cannot, etc. All animals first wild. Man tames those whom he can use.

(*c*) 2.—OTHER ANIMALS THAT WORK FOR MAN.

(Objects exhibited: Specimens of silk, models or pictures of silkworms; honey, honey-comb, pictures of hive, etc.; coral, and coral limestone.)

Silk.—Note generally the changes in the life of the caterpillar. Winding, spinning, and weaving the silk, etc.

Honey and Wax.—Result of visit of bees to flowers—*i.e.*, 1st to themselves, 2nd to the flowers.

Coral, and the Coral Animal (don't call the creature the coral *insect*).—Builds up enormous coral-reefs. Become good limestone.

PART V.

(*a*) 1.—FRESH AIR.

(Objects exhibited: Pictures of a town scene and a country scene; of a town boy and a country boy; of London shopman or shopgirl, and a country farmer, or Welsh milkmaid.

Carry on a conversation about the pictures. Note the difference between town and country life. What makes the difference? Different air breathed. Good air, bad air. Good air becomes bad by (1) being breathed, (2) being near dirty places—*i.e.*, dirty rooms, dirty clothes, dust-holes, dirty water, dust, etc. How to have fresh, good air: open windows, clean the rooms, yards, bodies, and clothes.

(*Note.*—Say nothing to the 'First Standard' about oxygen, carbonic acid, etc.)

(*a*) 2.—HEALTH: CLEAN BODIES AND CLOTHES.

(Objects exhibited: Bring out from the class a very dirty boy; if possible, one who has been spoken to about his untidy and dirty appearance.)

All people want to be healthy and strong. Why? To poor people, health and strength mean ability to earn more wages. To all people, rich and poor, want of health means want of happiness. After fresh air, and partly to obtain fresh air, must have clean

bodies and clean clothes. Why bodies get dirty :—Perspiration on the body collects the dust, etc., from the air. Perspiration, *i.e.*, decayed matter, must come from inside of body, and therefore skin should be thoroughly washed. Why clothes get dirty :—Clothes next skin, from the body; clothes outside, from air, etc. Bad to have clothes which *hide* the dirt, *i.e.*, dark-coloured stockings, shirts, etc.; want things to *show* the dirt when dirty. Want people to feel uncomfortable and ashamed when dirty.

(*a*) 3.—HEALTH : HAPPY DISPOSITION.

(Objects exhibited : Specimens or pictures of a cross, ill-tempered, sulky lad, and of a kind and amiable one.)

Note which looks the happier and more healthy of the two. Cannot have health if the food does not properly digest. Anger and sulks spoil digestion, and so injure health. Therefore good for health to have happy disposition. This can be formed or encouraged by (1) always having something to do. Laziness and cheerfulness never go together. (2) Trying to make other creatures happy—even if only dogs, birds, etc. Unkindness and cruelty breed sulkiness and unhappiness. (3) Bearing any little trouble patiently; not flying into a temper. (4) Having plenty of outdoor exercise, either work or play. (5) Having a good 'hobby'—*i.e.*, keeping birds, or rabbits, or a dog; or taking a delight in cricket, rowing, music, etc.; or making collections of flowers, rocks, insects, etc. (6) Being contented with what we have when nothing better is to be obtained.

(*a*) 4.—HEALTH : PROPER FOOD.

(Objects exhibited : Pictures or descriptions of a strong man who eats plenty of bread, meat, and vegetables; who works hard, and drinks little else than clean water; and of a miserable-looking woman, who is always hanging about public-houses, drinks gin, and eats very little.)

Cannot have health without proper food. The plainest and cheapest food is generally the best, *i.e.*, rice, sugar, milk, bread, with butter or treacle; and for children, either water, or milk and water. In summer, ripe fruit and vegetables. For grown-up people, meat also.

Things bad for children : strong tea, or coffee, beer, spirits, heavy pastry, unripe or over-ripe fruit, rich cake, ices, etc., and much fat of any kind.

(*Note.*—In the First Standard better not attempt any classification of food-stuffs.)

(*b*) 1.—WATER : GENERAL PROPERTIES.

(Objects exhibited : Jug of water, tea-tray, oil-flask, and spirit-lamp. Slate, or piece of sheet-metal. Picture of apparatus for showing water standing at one level in a series of differently-shaped vessels connected with each other.)

Water, as we generally see it, is a liquid : becomes solid when the weather is frosty; changes into steam by heat (experiment). Returns to water by cold (experiment). Flowing water always finds the lowest place. (Pour some water on the slanted tea-tray.) Surface of still water level. Different bodies of water, if in connection, always stand at the same level (illustration). All plants take in water by the roots and give some out by the leaves. Animals take water with their food and give out some by the skin. Plants and animals would die without water.

(*Note.*—Do not at present introduce the terms evaporation and condensation.)

(*b*) 2.—WATER ON THE LAND.

(Objects exhibited : Pictures of the sea, a lake, a river, etc., or models.)

After a shower, pavement is wet : soon after we find it dry. The water has gone into the air. Therefore there is water in the air as well as on the land. (Other illustrations.)

Most of the rain soaks into the ground. May meet with substances through which it cannot soak; then flows along underground and comes out as a spring. Many springs form brooks and rivulets; these unite to form rivers. Rivers or brooks flow into hollows, and form lakes, etc. A lake is a hollow place full of water. A sea, a great hollow or deep place full of water. If lake or sea were drained, could see the hollow. Same with ocean. Show globe; carry on a conversation about the water surface and land surface.

(*b*) 3.—WATER IN THE AIR.

(Objects exhibited : Picture of clouds. An oil-flask, with pointed glass tube fitted. A spirit-lamp for boiling some water in the flask.)

Boil some water in the flask. Cloud of white steam rushing from point of glass tube. Steam, nothing but small particles of water. (Clear glass, if ground to a powder, is white also.) Cloud of white steam seems to come to nothing : goes into the air and cannot be seen, but yet it is there (prove this). Therefore, water in the air in *two* forms : (1) can be seen (= steam); (2) cannot be seen (= vapour). Clouds are steam. Sometimes very little particles of water unite : form a drop. Many drops, a shower. Dew is the vapour from the air settling upon the cold earth, twigs, etc. If night frosty, dew becomes hoar-frost.

(To be continued.)

—o—

Julius Cæsar.

ACT I.

Scene II.—*continued.*

Bru. That you do love me, I am nothing jealous;
What you would work me to, I have some aim :
How I have thought of this and of these times,
I shall recount hereafter; for this present,
I would not, so with love I might entreat you,
Be any further moved. What you have said
I will consider; what you have to say
I will with patience hear, and find a time
Both meet to hear and answer such high things.
Till then, my noble friend, chew upon this :
Brutus had rather be a villager
Than to repute himself a son of Rome
Under these hard conditions as this time
Is like to lay upon us.
Cas. I am glad that my weak words
Have struck but thus much show of fire from Brutus.
Bru. The games are done and Cæsar is returning.

Cas. As they pass by, pluck Casca by the sleeve;
And bade him follow; so indeed he did.
And he will, after his sour fashion, tell you
What hath proceeded worthy note to day.

Re-enter CÆSAR *and his train.*

Bru. I will do so. But, look you, Cassius,
The angry spot doth glow on Cæsar's brow,
And all the rest look like a chidden train:
Calpurnia's cheek is pale; and Cicero
Looks with such ferret and such fiery eyes
As we have seen him in the Capitol,
Being crossed in conference by some senators.

Cas. Casca will tell us what the matter is.

Cæs. Antonius!

Ant. Cæsar?

Cæs. Let me have men about me that are fat:
Sleek-headed men and such as sleep o' nights:
Yond Cassius has a lean and hungry look;
He thinks too much; such men are dangerous.

Ant. Fear him not, Cæsar; he's not dangerous.
He is a noble Roman and well given.

Cæs. Would he were fatter! but I fear him not:
Yet if my name were liable to fear,
I do not know the man I should avoid
So soon as that spare Cassius. He reads much;
He is a great observer and he looks
Quite through the deeds of men; he loves no plays,
As thou dost, Antony; he hears no music;
Seldom he smiles, and smiles in such a sort
As if he mock'd himself and scorn'd his spirit
That could be moved to smile at any thing.
Such men as he be never at heart's ease
Whiles they behold a greater than themselves,
And therefore are they very dangerous.
I rather tell thee what is to be fear'd
Than what I fear; for always I am Cæsar.
Come on my right hand, for this ear is deaf,
And tell me truly what thou think'st of him.

[*Sennet. Exeunt* CÆSAR *and all his Train but* CASCA.

Casca. You pull'd me by the cloak; would you speak with me?

Bru. Ay, Casca; tell us what hath chanced to-day,
That Cæsar looks so sad.

Casca. Why, you were with him, were you not?

Bru. I should not then ask Casca what had chanced.

Casca. Why, there was a crown offered him: and being offered him, he put it by with the back of his hand, thus; and then the people fell a-shouting.

Bru. What was the second noise for?

Casca. Why, for that too.

Cas. They shouted thrice: what was the last cry for?

Casca. Why, for that too.

Bru. Was the crown offered him thrice?

Casca. Ay, marry, was't, and he put it by thrice, every time gentler than other, and at every putting-by mine honest neighbours shouted.

Cas. Who offered him the crown?

Casca. Why, Antony.

Bru. Tell us the manner of it, gentle Casca.

Casca. I can as well be hanged as tell the manner of it: it were mere foolery; I did not mark it. I saw Mark Antony offer him a crown;—yet 'twas not a crown, neither, 'twas one of these coronets;—and, as I told you, he put it by once: but, for all that, to my thinking, he would fain have had it. Then he offered it to him again; then he put it by again: but, to my thinking, he was very loath to lay his fingers off it. And then he offered it the third time; he put it the third time by: and still as he refused it, the rabblement shouted and clapped their chopt hands and threw up their sweaty nightcaps, and uttered such a deal of stinking breath because Cæsar refused the crown, that it had almost choked Cæsar; for he swounded and fell down at it: and for mine own part, I durst not laugh, for fear of opening my lips and receiving the bad air.

Cas. But, soft, I pray you: what, did Cæsar swound?

Casca. He fell down in the market-place, and foamed at mouth, and was speechless.

Bru. 'Tis very like: he hath the falling sickness.

Cas. No, Cæsar hath it not; but you and I
And honest Casca, we have the falling sickness.

Casca. I know not what you mean by that; but, I am sure, Cæsar fell down. If the tag-rag people did not clap him and hiss him, according as he pleased and displeased them, as they use to do the players in the theatre, I am no true man.

Bru. What said he when he came unto himself?

Casca. Marry, before he fell down, when he perceived the common herd was glad he refused the crown, he plucked me ope his doublet and offered them his throat to cut. An I had been a man of any occupation, if I would not have taken him at a word, I would I might go to hell among the rogues. And so he fell. When he came to himself again, he said, If he had done or said anything amiss, he desired their worships to think it was his infirmity. Three or four wenches, where I stood, cried, 'Alas! good soul!' and forgave him with all their hearts: but there's no heed to be taken of them; if Cæsar had stabbed their mothers, they would have done no less.

Bru. And after that, he came, thus sad, away?

Casca. Ay.

Cas. Did Cicero say anything?

Casca. Ay, he spoke Greek.

Cas. To what effect?

Casca. Nay, an I tell you that, I'll ne'er look you i' the face again: but those that understood him smiled at one another and shook their heads: but, for mine own part, it was Greek to me. I could tell you more news too: Marullus and Flavius, for pulling scarfs off Cæsar's images, are put to silence. Fare you well. There was more foolery yet, if I could remember it.

Cas. Will you sup with me to-night, Casca?

Casca. No, I am promised forth.

Cas. Will you dine with me to-morrow?

Casca. Ay, if I be alive and your mind hold and your dinner worth the eating.

Cas. Good: I will expect you.

Casca. Do so. Farewell, both. [*Exit.*

Bru. What a blunt fellow is this grown to be!
He was quick mettle when he went to school.

Cas. So is he now in execution
Of any bold or noble enterprise,
However he puts on this tardy form.
This rudeness is a sauce to his good wit,
Which gives men stomach to digest his words
With better appetite.

Bru. And so it is. For this time I will leave you:
To-morrow, if you please to speak with me,
I will come home to you; or, if you will,
Come home to me, and I will wait for you.

Cas. I will do so: till then, think of the world.
[*Exit* BRUTUS.
Well, Brutus, thou art noble; yet, I see,
Thy honourable metal may be wrought
From that it is disposed: therefore it is meet
That noble minds keep ever with their likes;
For who so firm that cannot be seduced? 310
Cæsar doth bear me hard; but he loves Brutus:
If I were Brutus now and he were Cassius,
He should not humour me. I will this night,
In several hands, in at his window throw,
As if they came from several citizens,
Writings all tending to the great opinion
That Rome holds of his name; wherein obscurely
Cæsar's ambition shall be glancèd at.
And after this let Cæsar seat him sure; 319
For we will shake him, or worse days endure. [*Exit.*

NOTES ON SCENE II.—*(continued).*

162. The beginning of a speech in Brutus's highest vein. It is in both matter and manner an excellent one to paraphrase. 'I have no doubt as to your love to me. I have some guess as to whither you would move me. My thoughts of Rome, of Cæsar, of yourself, of me, I may talk on in the after-time. Now, for our love's sake, move me no more. All that I have heard from you shall have my thought. All that I am to hear shall be heard with calmness, with forbearance, and for the hearing and the answering the fitting time shall be forthcoming. Till it come hold this within your heart of hearts. Your friend would rather dwell with village-hinds than live with Roman men on terms such as the time now threatens.'

162. Dramatic iambic. *Jealous.*—Doubtful. I know you love me.

163. *I have some aim.*—I partly guess.

164. There is much pathos in this dreamy retrospect. Half-inclined to tell his Cassius how he has thought, he pauses and will recount it all in the hereafter that never comes.

166. His appeal is to love, as his first assurance in line 162 was of love.

167. *Moved.*—He is very deeply moved. His own thoughts, the shouts that bode so much in respect to Cæsar, Cassius' probing and prompting, all these move him very strangely.

170. *High things.*—They are more momentous to him than to, perhaps, any other who takes part in them.

171. *Chew.*—Reflect.

173. Note the redundant 'to.'

174. *These.*—Such. Or, if we read 'which' for 'as,' making this last a relative pronoun, we get the sense of the line.

175. An impossible line unless we read it as an Alexandrian, and at the same time slur the ''pon us' and the 'I am.'

177. Brutus' nature is as that of the flint. The fire lies concealed within a cold, a hard exterior. But it is there, if you but strike.

178, 180. Dramatic iambics.

182—188. A wonderful word-picture. Under the words of Brutus the face of each individual, the grouping of all grow into sight. Notice the art with which the brow of the dictator, the cheek of the wife, the eyes of the great thinker are named. And for an instance of his power of doing so much with so few words take the 'chidden train' of line 184.

186. *Ferret.*—The ferret's eyes are keen and are red.

189. *Casca will tell us.*—How careful he is in his keeping the smallest characters upon distinct lines. Casca is the officious, obtrusive person. He is the likeliest to tell all that has occurred.

190. This calling for Antonius twice in one scene, when he calls for none other in it save once for Calpuaria, has its meaning. It is to Antonius that he turns now when he is in doubt and in anger.

192, 193. Antonius is one that lives well. The two men how have spoken apart are thin, spare-bodied, worn-faced.

Sleek-headed.—A Shakespearian double adjective.

194. *Yond.*—Yonder. Old form, *grond.* Now we write 'yon' generally.

195. Men who think have been, are, and for ever will be, dangerous to despotisms. When all men think, depotisms will be impossible.

197. *Noble.*—Nobilis = well-born. *Given* = disposed.

198. Note the ellipsis of the I at the beginning of the line.

199. *My name.*—A periphrasis for Cæsar.

201. The characters of an opposer of a tyrant are here named by a tyrant: study, observation, keenness, the love of work as opposed to gamesomeness, a face not wreathed in smiles.

203. *Plays.*—For light things generally. A man like Cassius would be a student of the drama, but not as Antony, one that 'revels long o' nights.'

204. *No music.*—Here is, we may think, a blunder. These great and thoughtful natures seek the solace of music; and this is said despite 'Merchant of Venice,' V. i., 83-85:—

> 'The man that hath no music in himself,
> Nor is not moved with concord of sweet sounds,
> Is fit for treasons, stratagems, and spoils.'

For Cassius is plotting, as he honestly believes, for his country's good.

209. *Whiles.*—The 'es' is probably a genitive ending.

210. *Very dangerous.*—These words, and indeed the whole of the speech, are more to himself than to any other.

211. The recovery from his morbid self-communing is on this line. The thoughtful student of Shakespeare will have noted in line 204 the partial return to his surroundings in the 'As thou dost, Antony.' Here the return is complete.

213. *This ear is deaf.*—Shakespeare alone is responsible for this infirmity of Cæsar. But the fancy is allowable, when it leads up to the motioning of Antony from the side of Cæsar that is nearer to the men he suspects to that whereon there is less likelihood of their low talk being overheard.

215. *You.*—Which of them? I think Cassius, although his companion speaks first.

217. *Chanced.*—Happened.

218. *Sad.*—Thoughtful. Sedeo = I sit down. And when the pause comes the thought is always serious.

223. *A-shouting.*—To shouting. Compare the Latin 'ad clamandum.'

229. *Marry.*—An oath, curiously out of place in a Roman mouth. The Virgin Mary was not known in Casca's time.

230. *Mine honest neighbours.*—As we say in our patronising way, 'My good fellow.'

234. *Gentle.*—An adjective as inconsistent with Casca as his word 'marry.' But the use of it is quite consistent with the kindliness of Brutus.

236. *Mere.*—Absolute. 'Merum vinum' = pure wine.

238. *Coronets.*—Diminutive of crowns. *Find other cases.*

239. *Fain.*—Fægn = glad.

243. *Rabblement.*—Mob.

247. *Swounded.*—The unnecessary 'd' is often inserted after the letter 'n.' Examples are found in 'gender' from the Latin 'genus,' through the French 'genre.'

250. This swooning is a puzzle to Cassius.

253. The lover of Cæsar speaks here.

254. Ready Cassius seizes the chance of turning even the sickness of the dictator to account.

256. Casca is not over-shrewd, though honest enough in his declaration of ignorance.

257. *Tag-rag.*—An instance of the alliterative and reduplicative words that are common in the vocabulary of the uneducated. Compare hurly-burly, helter-skelter. *Find three other examples.*

259. *Use.*—Are wont.

263. *Plucked me.*—A colloquial use of the personal pronoun.

264. *An.*—If.

265. *Occupation.*—Trade. Casca is one of the idlers who have their living got for them, instead of honestly getting it themselves.

279. A habit with Cicero, many of whose so-called jokes, very ponderous to the modern ear, are recorded in the tongue that every educated Roman knew as an educated Englishman knows French to-day.

281. Probably there is more affectation than honesty in Casca here. If Plutarch may be trusted, he certainly spoke Greek.

286. It is time to be doing.

287. *Promised forth.*—Promised to go out.

294. *Quick metal* = Lively.

295. *Execution.*—The observation of Cassius is as accurate as ever; for in the murder-scene (III., i.) it is Casca who strikes the first blow.

305. *Think of the world.*—Ponder. The time is serious, is out of joint, and it is for us to consider if in us it lies to set it right.

308. A preposition is omitted.

311. *Bear me hard.*—Our observer has noted Cæsar's behaviour down to the last whispered conversation with Antony.

313. *He.*—Brutus. *Humour.*—Play upon me.

314. *Several.*—Different. A plot not wholly worthy of Cassius, but in keeping with the character that Shakespeare draws rather for the sake of dramatic contrast, and to heighten that of Brutus, than to give a veritable picture of the actual Cassius.

Christmas Certificate Examination, 1882.

(Continued from page 248.)

MALE AND FEMALE CANDIDATES (FIRST YEAR).

British History.

Three hours allowed for this paper.

Candidates are not to answer more than EIGHT questions.

Simon de Montfort.—Earl of Leicester; married Eleanor, sister of Henry III. Led barons in rebellion in 1258. Defeated Henry III. at Lewes. Called Parliament from towns and cities, as well as from counties, in 1265. Killed at the battle of Evesham same year.

William Wallace.—Of Ellerslie. Asserted Scottish liberty after submission of Scotland to Edward I. Defeated English at Stirling, 1297, driving them from Scotland. Was afterwards defeated at Falkirk, 1305, and being betrayed, was hanged as a traitor at Smithfield.

Owain Glyndwr.—Welchman, who claimed descent from native princes. Captured Earl of Mareh, and was joined by Earl of Northumberland in rebellion against Henry IV. Held his ground during the whole of Henry's reign (1399-1413). Died several years after the accession of Henry V.

2. Of what historical events do the following dates remind you:—84, 878, 1016, 1314, 1415, 1588, 1605, 1660, 1688, 1745, 1798, 1815, 1837?

A.D.

84. Defeat of the Caledonian chief, Galgacus, by Julius Agricola, the discovery that Britain was an island, and the close of Agricola's campaign.

878. Battle of Ethandune, and peace of Wedmore. Treaty between Alfred and the Danes.

1016. Division of England between Canute and Edmund Ironside.

1314. Battle of Bannockburn. Defeat of the English, and independence of Scotland.

1415. Battle of Agincourt.

1588. Defeat of the Spanish Armada.

1605. Discovery of Gunpowder Plot.

1660. Restoration of Stuart dynasty in the person of Charles II.

1688. Trial and acquittal of the seven bishops; landing of William, Prince of Orange, and flight of James II.

1745. Rebellion in Scotland in favour of Charles Edward Stewart, grandson of James II., and called the Young Pretender.

1798. The battle of the Nile, resulting in the defeat of the French fleet; rebellion in Ireland.

1815. Battle of Waterloo, final defeat of Napoleon, and his banishment to St. Helena.

1837. Accession of Queen Victoria; rebellion in Canada.

3. Which of the kings of England were termed the Great, the Martyr, the Ironside, the Unready, the Harefoot, the Confessor, the Rufus, the Lion-hearted, the Lack-land, the English Justinian? Give the dates of their rule and explain the circumstances which gave rise to their appellation.

The Great.—Alfred (871-901), so called on account of the general nobleness of his character, and the importance of the proceedings in which he took part. He defeated the Danes, fortified the country, established the militia, encouraged learning, built schools, etc.

The Martyr.—Edward (975-978). Succession was disputed. Dunstan gained him the crown, but he was stabbed at Corfe Castle. The manner of his death gave him his name.

The Ironside.—Edmund (1016). So called from his perseverance and valour in fighting the Danes.

The Unready.—Ethelred (979-1016). Name given to him from his imbecility and indolence, and general unpreparedness for meeting his enemies. Bribed the Danes instead of fighting them.

The Harefoot—Harold I. (1036-1039). Chief amusement, hunting. From the fleetness with which he followed the game on foot, he was called Harefoot.

The Confessor.—Edward (1041-1066). From his religious character.

The Rufus.—William II. (1087-1100). So called on account of his red hair.

The Lion-hearted.—Richard I. (1189-1199). From his daring valour and great muscular strength.

The Lack-land.—John (1199-1216). From the fact of his having no share in the possessions with which his brothers were largely endowed. He lost Ireland by his own folly.

The English Justinian.—Edward I. (1272-1307). From the numerous alterations in the laws made under his rule, and the wisdom which marked their character.

4. Wales has exercised a powerful influence over the affairs of England. Give particulars of this influence.

Wales proved a formidable opponent to the Saxon invaders of England, and when the Saxon rulers had established their rule, the Welsh were only with difficulty kept in subjection by the kings of this country. They resisted for a considerable time the pretensions of the power of Rome, as represented by Augustine.

In the reigns of the first Norman kings several expeditions took place against the Welsh, which were unsuccessful, although they were finally subdued by Edward I. The Welsh have always maintained a character for independence, and in this way have exercised a powerful influence upon England. They have retained their national characteristics and language, and much of their spirit has been infused into the English nation.

5. Give the names and dates of the kings of Scotland who invaded England, and of those who were imprisoned in England.

Malcolm.—1093. Was killed in attempting to assert his right to Northumberland at the siege of Alnwick.

David I.—1138. Invaded England in favour of his niece Maud; was defeated at Northallerton in the battle of the Standard.

William I.—Was made a prisoner at Alnwick in 1172, obtaining his release by taking oath of allegiance to Henry II.

Bruce.—1314, after Bannockburn, Scotch under Bruce ravaged Cumberland and Durham, and again in 1327.

David II.—Invaded England while Edward III. was in France. Defeated by Philippa, the queen, at Neville's Cross, near Durham, 1346; taken prisoner, and kept a captive eleven years.

James I.—Taken prisoner when a boy of fourteen, on his way to France, 1406; kept in England for nineteen years.

James IV.—Invaded England in 1513; was defeated and killed at Flodden Field, in Northumberland.

Mary Queen of Scots.—Escaped from Lochleven Castle in 1568, and after battle of Langside, fled to England, where she was kept till beheaded by Elizabeth in 1587.

6. Relate the circumstances that led to King John's signature of Magna Carta. What sections of society did the Charter affect? Write the *two* most important of its articles.

A quarrel with the pope respecting the appointment of an archbishop of Canterbury ended in the kingdom being laid under an interdict, during which time the people's anger increased against the tyranny of the king. On his submission to the pope, after Louis had been commissioned to invade England, John sailed to France, bringing back with him a number of men from Anjou and Poitou, whom he made his favourites and courtiers. Their exactions and assumptions of power rendered them obnoxious to both the nobles and the common people, who united in one cause against the king. They together demanded the signature of the Magna Carta.

It affected every class of society, from the nobles to the villeins.

Its two principal clauses are as follows:—'No freeman shall be taken, or imprisoned, or disseised of his freehold, or liberties, or free customs, or be outlawed, or exiled, or any otherwise destroyed; nor will we pass upon him nor send upon him but by lawful judgment of his peers, or by the law of the land. We will sell to no man, we will not deny or delay to any man, justice or right.'

These clauses established the right of personal liberty and a free trial.

7. Describe the leading features of the French campaign of Edward III.

Edward III. and Philip of Valois were rival claimants to the French throne, the former claiming it through his mother, who was a daughter of Philip IV. The Salic law barred Edward's claim, but he determined to assert his right by force of arms. Two attempts were unsuccessful, but the naval victory of Sluys was gained in 1340. Then followed a truce for a year. In 1346 Edward landed at La Hogue, and at Crecy a great battle was fought, resulting in the complete defeat of the French. The siege of Calais lasted a year, and although the King of France attempted to relieve the town, an unconditional surrender took place in 1347. Another truce followed, which ended in 1355. Edward again invaded France from the north, and the Black Prince from the south, gaining a decisive victory at Poictiers, 1356. King John was taken prisoner to London, gaining his liberty only by a large ransom. Soon afterwards Edward renounced his claim to France, retaining only Poitou and Guienne free from homage to the French king.

8. Give some account of the condition of the peasantry of England from 1350 to 1550. In whose reign did our modern poor-laws originate?

In the early part of this period the peasantry of England were principally serfs. They cultivated the lands, paid their rent in work for the landlords, seldom possessing any land of their own; were almost invariably badly treated, especially after the French campaign of Edward III. Heavy taxes were imposed upon the people, and rebellions, under Wat Tyler and Jack Straw took place in 1381, and Jack Cade in 1450.

During the Wars of the Roses the people had been gradually gaining more freedom, and the extinction of villenage was one of the results of those conflicts. In the early part of the Tudor period considerable injury was done to the interests of the poor by the dissolution of the monasteries, by the inclosure of lands, and many of the farms being turned from tillage to pasturage. Their condition, however, had greatly improved during the two hundred years.

In 1546 a bill providing that impotent, maimed, and aged persons should have houses provided for them was passed. In 1662 justices were empowered to remand every one unable to maintain himself to the parish where he was born, and this act remained in force for nearly 130 years. In the year 1834 was passed the law which now mostly regulates the condition of paupers in this country, William the Fourth being then king.

9. What led to the Wars of the Roses? How were these wars brought to a close?

Edward the Third had seven sons, the eldest of whom was the Black Prince, who died before his father. Edward was succeeded by his grandson, Richard II., the only son of the Prince. During his reign he banished his cousin Henry, and at his uncle's death took possession of the whole of his property. Henry returned to claim it, and took Richard prisoner, the Parliament deposing the king in 1399, and proclaiming Henry in his stead. Henry, however, was the descendant only of the third son of Edward III., and there were descendants of an elder son, Lionel, living. The rival claims of these two families, the latter of which became united to the descendants of the fifth son, led to the Wars of the Roses.

They were ended by the union of the rival claims in the persons of Henry Tudor, Earl of Richmond, afterwards Henry VII., and Elizabeth of York.

10. What happened in Ireland during the reigns of Elizabeth, James I., and William III.?

The last great attempt at the independence of Ireland took place in the reign of Elizabeth, 1595 to 1602. The Earl of Tyrone rose in revolt, and took possession of Munster in 1599. The Earl of Essex failed in putting down the rebellion, which was ultimately done by the Earl of Mountjoy. The Spaniards who came to help Tyrone surrendered in 1602, and the insurrection closed after a seven-years' existence.

James I. dispossessed the Irish rebel chiefs in Ulster, giving their land chiefly to Protestant Episcopalian settlers from Great Britain. These Plantations were the foundation of the prosperity of that part of Ireland.

The Roman Catholics of Ireland took the part of the deposed king, James II., and he made an attempt to recover his kingdom from that country. The siege of Londonderry took place in 1690, but was unsuccessful, and was raised in June of that year. Then followed the battle of the Boyne, James's flight to France, the battle of Aughrim, and the siege of Limerick, ending in a treaty which acknowledged William as King of Ireland.

11. Give an account of the regents of Scotland.

Robert III. of Scotland was assisted in his government by the *Duke of Albany*, who became regent on the king's death in 1406. During his term of office there was a persecution of the Lollards, and battles were fought which settled the disputed supremacy between the kings of Scotland and the lords of the isles. Albany died in 1419.

Murdoch, his son, succeeded to the regency, but was a weak ruler, and the country lapsed into great disorder, James, the son of Robert, finding it in this state when he was released from prison in England. James put him to death soon after his accession in 1424.

After the battle of Flodden Field, in 1513, a long minority of fifteen years caused many struggles for supremacy among the Scottish nobles, the quarrel resting chiefly between the Earl of Angus, the head of the Douglass family, who married the queen, and the Duke of Albany. *Albany* became regent in 1515, and during his regency he visited France. On his return he raised an army for the invasion of England, but went no further than Carlisle. When James assumed the reins of government he again went to France.

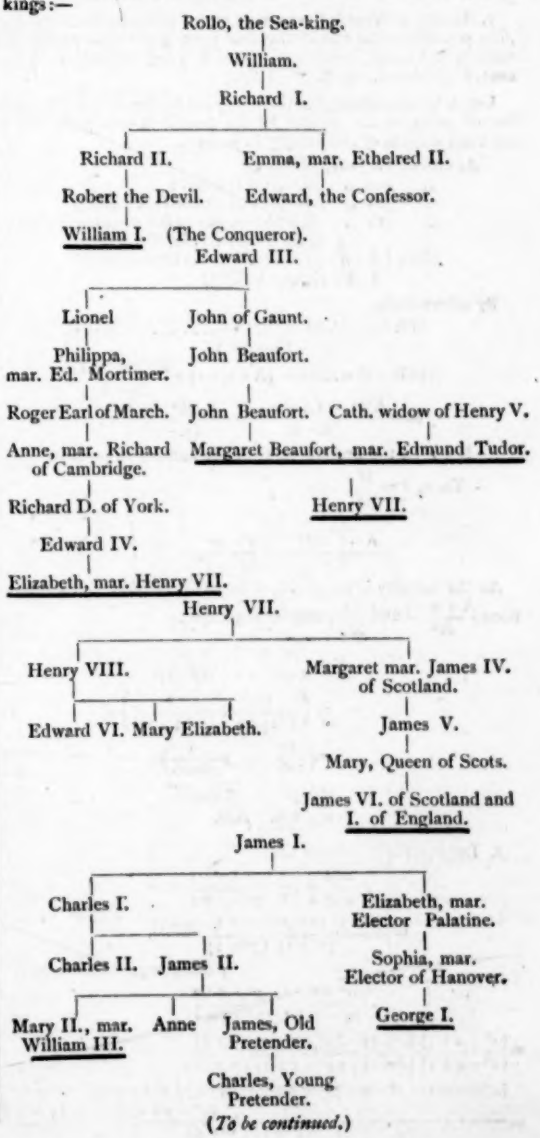
Earl of Arran.—On the death of James V., he wrested the regency from ***Cardinal Beton***, appointed regent in the will of James V. Defeated by the English at Pinkie, Arran soon after resigned the regency to ***Mary of Guise***, who made an ineffectual attempt to prevent the spread of the Protestant faith. The ***Earl of Moray*** became regent on the deposition of Mary, whom he defeated at Langside. He was afterwards killed by Hamilton, of Bothwell.

12. How do you account for the arbitrary character of the government of Charles I.?

The arbitrary character of Charles's government may be traced to two causes—the principles which he inherited from his father, and the influence exerted over him by those whom he chose as his counsellors in the early part of his reign. From his father he derived those ideas which may be summed up in the words, 'Divine right.' His desire for absolute power was even more intense than that of James I. His queen had inherited the same ideas, and during the whole of his reign she aided and abetted him in the pursuit of this object. Buckingham, also, who shared his favour along with the queen, was of an arbitrary disposition, and to these persons must be given no small share of the responsibility for Charles's arbitrary acts.

13. Show the descent of William I., Henry VII., James I., William III., George I.

The following tables show the descent of the respective kings:—



(*To be continued.*)

Query Column.

RULES.

1. Each correspondent is restricted to *one question.* We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ **When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.**

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher, Pilgrim Street, Ludgate Hill, London, E.C.*

Algebra.

1. WAKE.—What is the present worth of a perpetual annuity, £10 payable at the end of the first year, £11 at the end of the second, and so on, increasing £1 each year, interest at 4 per cent.? (*London, 1st B. A.*, 1882.)

Let A be the annuity for the first year in pounds, n the number of years, R the amount of one pound in one year, and M the total amount of the annuity in pounds.

At end of 1st year, $M=A$;
" 2nd " $M=(A+1)+AR$;
" 3rd " $M=(A+2)+(A+1)R+AR^2$;
$\therefore$ " nth " $M=(A+n-1)+(A+n-2)R$
$+\ldots\ldots+(A+1)R^{n-2}+AR^{n-1}$;

$MR=(A+n-1)R+(A+n-2)R^2+\ldots\ldots$
$+(A+1)R^{n-1}+AR^n$;

By subtraction,

$$MR-R=AR^n+R^{n-1}+\ldots\ldots+R^2+R-(A+n-1),$$

$$M(R-1)=AR^n-(A+n-1)+\frac{R(R^{n-1}-1)}{R-1},$$

$$M=\frac{AR^n-(A+n-1)}{R-1}+\frac{R(R^{n-1}-1)}{(R-1)^2};$$

Let P be the present value of the annuity in pounds.

Then, $P=\frac{M}{R^n}$

$$=\frac{A-\frac{A+n-1}{R^n}}{R-1}+\frac{1-\frac{1}{R^{n-1}}}{(R-1)^2};$$

As the annuity is perpetual, n becomes infinite, and the fractions $\frac{A+n-1}{R^n}$ and $\frac{1}{R^{n-1}}$ may be neglected.

$$\therefore P=\frac{A}{R-1}+\frac{1}{(R-1)^2}$$
$$=\left\{\frac{10}{1\cdot04-1}+\frac{1}{(1\cdot04-1)^2}\right\}£$$
$$=\left(\frac{10}{\cdot04}+\frac{1}{\cdot0016}\right)£$$
$$=(250+625)£$$
$$=\underline{£875.}\quad \text{Ans.}$$

2. INQUISITIVE.—Show that—

$$\frac{x^3+x+1}{x^3-x+1}\cdot\frac{y^3+y+1}{y^3-y+1}=\frac{2(x-y)(1-xy)(x+1)(y+1)}{(x^3+1)(y^3+1)}.$$

(*Edinburgh University.*)

$$\frac{x^3+x+1}{x^3-x+1}\cdot\frac{y^3+y+1}{y^3-y+1}$$
$$=\frac{(x^3+x+1)(x+1)}{(x^3-x+1)(x+1)}\cdot\frac{(y^3+y+1)(y+1)}{(y^3-y+1)(y+1)}$$
$$=\frac{(x^3+x+1)(y^3-y+1)(x+1)(y+1)-\{(y^3+y+1)(x^3-x+1)(x+1)(y+1)\}}{(x^3+1)(y^3+1)}$$
$$=\frac{(x+1)(y+1)\{(x^3+x+1)(y^3-y+1)-(y^3+y+1)(x^3-x+1)\}}{(x^3+1)(y^3+1)}$$
$$=\frac{(x+1)(y+1)\{x^3y^3+xy^3+y^3-x^3y-xy-y+x^3+x+1-(x^3y^3-xy^3+y^3+x^3y-xy+y+x^3-x+1)\}}{(x^3+1)(y^3+1)}$$
$$=\frac{(x+1)(y+1)\{2xy^3-2x^2y-2y+2x\}}{(x^3+1)(y^3+1)}$$
$$=\frac{(x+1)(y+1)[2\{x-y-xy(x-y)\}]}{(x^3+1)(y^3+1)}$$
$$=\frac{(x+1)(y+1)\{2(x-y)(1-xy)\}}{(x^3+1)(y^3+1)}$$
$$=\underline{\frac{2(x-y)(1-xy)(x+1)(y+1)}{(x^3+1)(y^3+1)}}.$$

3. OGLEV HAV.—Find the 8th term of an AR. series of n terms, the sum of which $=\frac{n}{2}\left(\frac{n^2}{3}+\frac{1}{4}\right)$. (*Colenso.*)

By putting $n=1$, we obtain the 1st term;

$\therefore$ 1st term $=\frac{1}{2}(\frac{1}{3}+\frac{1}{4})$
$=\frac{1}{2}\times\frac{7}{12}$
$=\frac{7}{24}$;

By putting $n=2$, we obtain the sum of the 1st and 2nd terms;

$\therefore$ Sum of 1st and 2nd terms $=\frac{2}{2}\left(\frac{2^3}{3}+\frac{1}{4}\right)$
$=\frac{8}{3}+\frac{1}{4}$
$=1\frac{7}{12}$;

$\therefore$ Difference $=1\frac{7}{12}-(\frac{7}{24}\times2)$
$=1\frac{7}{12}-\frac{7}{12}$
$=1$;

$\therefore$ 8th term $=a+(8-1)d$
$=\frac{7}{24}+7$
$=\underline{7\frac{7}{24}.}$ Ans.

4.—SYNOPSIS.—The first term of a geometrical progression is a, and the 10th term is b; find the nth term. (*1st B.A.*, 1882.)

10th term $=ar^9$
$\therefore\ b=ar^9$
$r^9=\frac{b}{a}$

$$\therefore r=\underline{\sqrt[9]{\frac{b}{a}}.}$$

nth term $=ar^{n-1}$

$$=\underline{a\left\{\sqrt[9]{\frac{b}{a}}\right\}^{n-1},\ \text{or}\ a\left(\frac{b}{a}\right)^{\frac{n-1}{9}}}$$

5. LEGUMISTE.—A man invested £2,000 in cottages: a certain number were then burnt down, but, in consequence of their having been insured, the loss on each cottage was only 10 per cent. on its cost price, and was also found to be at the rate of £10 on each cottage bought: some time after the remainder were sold 20 per cent. dearer than they had been bought, and the total gain was £100. How many cottages were originally

bought, and how many were burnt? (*Jones* and *Cheyne's* 'Algebraical Exercises.')

Let x = No. bought,
And ,, y = ,, burnt;

Then, $\frac{2000}{x}$ = cost price of each cottage in pounds;

$$\therefore \quad (1)\ \left(\tfrac{1}{10}\text{ of }\frac{2000}{x}\right)\times y = 10x$$
$$(2)\ \left(\tfrac{1}{8}\text{ of }\frac{2000}{x}\right)\times(x-y) = 10x+100$$

$$(1)\ \frac{200y}{x} = 10x$$
$$(2)\ \frac{400(x-y)}{x} = 10x + 100$$

$$(1)\ 20y = x^2$$
$$(2)\ 40(x-y) = x^2 + 10x$$

$$(1)\ 20y = x^2$$
$$(2)\ 40y = -x^2 + 30x$$

$$(1)\ 40y = 2x^2$$
$$(2)\ 40y = -x^2 + 30x$$

Subtracting, $3x^2 - 30x = 0$
$x^2 = 10x$
Dividing by x $\quad \therefore\ x = 10$

$$(1)\ 20y = x^2$$
$$20y = 100$$
$$\therefore\ y = 5.$$

$\therefore$ No. of cottages bought = 10
,, ,, ,, burnt = 5.

Note—Your writing will perhaps obtain the full percentage of marks at a Civil Service examination. It is very *bold* and *distinct*.

6. ESOMAL.—Show that the continued product—$(a_1^2 - b_1^2)(a_2^2 - b_2^2)\ldots\ldots(a_n^2 - b_n^2)$ may always be written in the form $(A^2 - B^2)$. Find the values of A and B for the case $n = 3$. (*Science and Art*, December, 1881.)

$$\begin{aligned}(a_1^2 - b_1^2)(a_2^2 - b_2^2) &= a_1^2a_2^2 - a_1^2b_2^2 - a_2^2b_1^2 + b_1^2b_2^2\\ &= (a_1^2a_2^2 + b_1^2b_2^2) - (a_1^2b_2^2 + a_2^2b_1^2)\\ &= (a_1^2a_2^2 + 2a_1a_2b_1b_2 + b_1^2b_2^2)\\ &\quad - (a_1^2b_2^2 + 2a_1a_2b_1b_2 + a_2^2b_1^2)\\ &= \underline{(a_1a_2 + b_1b_2)^2 - (a_1b_2 + a_2b_1)^2.}\end{aligned}$$

$$\begin{aligned}&(a_1^2 - b_1^2)(a_2^2 - b_2^2)(a_3^2 - b_3^2)\\ &= (a_1^2a_2^2 - a_1^2b_2^2 - a_2^2b_1^2 + b_1^2b_2^2)(a_3^2 - b_3^2)\\ &= a_1^2a_2^2a_3^2 - a_1^2a_2^2b_3^2 - a_2^2a_3^2b_1^2 + a_3^2b_1^2b_2^2 - a_1^2a_3^2b_2^2\\ &\quad + a_2^2b_2^2b_3^2 + a_2^2b_1^2b_3^2 - b_1^2b_2^2b_3^2\\ &= (a_1^2a_2^2a_3^2 + a_1^2b_2^2b_3^2 + a_2^2b_1^2b_3^2 + a_3^2b_1^2b_2^2)\\ &\quad - (a_1^2a_3^2b_2^2 + a_2^2a_3^2b_1^2 + a_1^2a_2^2b_3^2 + b_1^2b_2^2b_3^2)\\ &= (a_1a_2a_3 + a_1b_2b_3 + a_2b_1b_3 + a_3b_1b_2)^2\\ &\quad - (a_1a_2b_3 + a_1a_3b_2 + a_2a_3b_1 + b_1b_2b_3)^2\end{aligned}$$

(By adding the same quantities to each, similarly to the first product.)

Or $(a_1a_2a_3 + a_1b_2b_3 + a_2b_1b_3 + a_3b_1b_2)^2$
$- (b_1b_2b_3 + b_1a_2a_3 + b_2a_1a_3 + b_3a_1a_2)^2.$

Similarly,

$$\begin{aligned}&(a_1^2 - b_1^2)(a_2^2 - b_2^2)(a_3^2 - b_3^2)(a_4^2 - b_4^2)\\ &= (a_1a_2a_3a_4 + a_1a_2b_3b_4 + a_1a_3b_2b_4 + a_1a_4b_2b_3\\ &\quad + a_2a_3b_1b_4 + a_2a_4b_1b_3 + a_3a_4b_1b_2 + b_1b_2b_3b_4)^2\\ &\quad - (a_1a_2a_3b_4 + a_1a_2a_4b_3 + a_1a_3a_4b_2 + a_2a_3a_4b_1\\ &\quad + a_1b_2b_3b_4 + a_2b_1b_3b_4 + a_3b_1b_2b_4 + a_4b_1b_2b_3)^2.\end{aligned}$$

$\therefore$ When n is odd :—

Continued product :—

$$\begin{aligned}&= (a_1a_2\ldots\ldots a_n + a_1b_2b_3\ldots b_n + a_2b_1b_3\ldots b_n\\ &\quad + \ldots\ldots + a_{n-1}b_1b_2\ldots b_{n-1}b_n + a_nb_1b_2\ldots b_{n-1})^2\\ &\quad - (a_1a_2\ldots\ldots a_{n-1}b_n + a_1a_3\ldots\ldots a_nb_2 + a_2a_3\ldots\ldots a_nb_1\\ &\quad + \ldots\ldots + a_2a_3\ldots\ldots a_{n-2}a_nb_{n-1} + b_1b_3\ldots\ldots b_n).\end{aligned}$$

$\therefore$ When n is even :—

Continued product :—

$$\begin{aligned}&= (a_1a_2\ldots\ldots a_n + a_1a_2\ldots\ldots a_{n-2}b_{n-1}b_n +\\ &\quad a_1a_3\ldots\ldots a_{n-1}b_2b_n + \ldots\ldots + a_3\ldots\ldots a_nb_1b_2\\ &\quad + b_1b_2\ldots\ldots b_n)^2 - (a_1a_2\ldots\ldots a_{n-1}b_n + a_1a_2a_4\ldots\ldots a_nb_3\\ &\quad + a_1a_3\ldots\ldots a_nb_2 + \ldots\ldots + a_{n-1}b_1b_3\ldots\ldots b_{n-2}b_n\\ &\quad + a_nb_1b_2\ldots\ldots b_{n-2}).\end{aligned}$$

When $n = 3$,

$A = a_1a_2a_3 + a_1b_2b_3 + a_2b_1b_3 + a_3b_1b_2$;
$B = a_1a_2b_3 + a_1a_3b_2 + a_2a_3b_1 + b_1b_2b_3$,
or $b_1b_2b_3 + b_1a_2a_3 + b_2a_1a_3 + b_3a_1a_2$.

7. DISCIPLUS.—Solve :—

$$\sqrt{xb} + \sqrt{b(a+x)} = x^{\frac{1}{2}}. \quad (\textit{Colenso.})$$
$$\sqrt{xb} + \sqrt{b(a+x)} = x^{\frac{1}{2}}$$
$$\sqrt{b(a+x)} = \sqrt{x} - \sqrt{bx}$$

Squaring each side $\quad b(a+x) = x - 2\sqrt{bx^2 + bx}$
$$ab + bx = x - 2x\sqrt{b} + bx$$
$$x - 2x\sqrt{b} = ab$$
$$x(1 - 2\sqrt{b}) = ab$$
$$\therefore\ x = \frac{ab}{1 - 2\sqrt{b}}.$$

8. PUZZLED.—Solve :—

$$\left.\begin{aligned}x^2 - x &= 5y^2\\ x^2 &= 21 + y^2\end{aligned}\right\}. \quad (\textit{Dalton.})$$

$$\left.\begin{aligned}(1)\ x^2 - x &= 5y^2\\ (2)\ x^2 &= 21 + y^2\end{aligned}\right\}$$
$$(1)\ 5y^2 = x^2 - x$$
$$\therefore\ y^2 = \frac{x^2 - x}{5}.$$

$$(2)\ x^2 = 21 + \frac{x^2 - x}{5}$$
$$5x^2 = 105 + x^2 - x$$
$$4x^2 + x = 105$$
$$x^2 + \frac{x}{4} = \frac{105}{4}$$

Completing the square $\quad x^2 + \frac{x}{4} + (\frac{1}{8})^2 = \frac{105}{4} + \frac{1}{64}$
$$= \frac{1681}{64}$$

Extracting square root $\quad x + \frac{1}{8} = \pm\frac{41}{8}$
$$x = \pm\tfrac{41}{8} - \tfrac{1}{8}$$
$$\therefore\ x = 5, \text{ or } -5\tfrac{1}{4}.$$

$$(1)\ y^2 = \frac{x(x-1)}{5}$$
$$= \frac{5(5-1)}{5}, \text{ or } \frac{-5\frac{1}{4}(-5\frac{1}{4}-1)}{5}$$
$$= 4, \text{ or } \frac{-\frac{21}{4}\times-\frac{25}{4}}{5}$$
$$= 4, \text{ or } \tfrac{105}{16}$$
$$\therefore\ y = \pm 2, \text{ or } \pm\frac{\sqrt{105}}{4}.$$

$$\therefore\ x = 5,\ y = \pm 2,$$
$$\text{or } x = -5\tfrac{1}{4},\ y = \pm\frac{\sqrt{105}}{4}.$$

9. SOLICITOR.—A certain crew pull 9 strokes to 8 of a certain other crew; but 79 of the latter are equal to 90 of the former. Which is the faster crew? Also if the faster crew start at a distance equivalent to four of their own strokes behind the other, how many strokes will they take before they bump them? (*Hamblin Smith.*)

90 strokes of 1st = 79 strokes of 2nd,
1 stroke ,, ,, = $\frac{79}{90}$ of a stroke of 2nd,
$\therefore$ 9 strokes ,, ,, = $(\frac{79}{90}\times 9)$ strokes of 2nd,
$= 7\frac{9}{10}$,, ,,

$\therefore$ Second is the faster crew.
Let x = No. of strokes;
Then, $\frac{x-4}{7\frac{9}{10}} = \frac{x}{8}$

$$\frac{10(x-4)}{79}=\frac{x}{8}$$
$$80(x-4)=79x$$
$$80x-79x=320$$
$$\therefore x=320$$
$\therefore$ No. of strokes = 320.

10. POLYPHEMUS.—If $a+b+c=0$, show that $a^4+b^4+c^4=2(ab+bc+ca)^2$. (*Scholarship*, 1880.)

$$a+b+c=0$$
$$(a+b+c)^2=0$$
$$a^2+b^2+c^2+2(ab+ac+bc)=0$$
$$a^2+b^2+c^2=-2(ab+ac-bc)$$
$$(a^2+b^2+c^2)^2=\{-2(ab+ac+bc)\}^2$$
$$a^4+b^4+c^4+2(a^2b^2+a^2c^2+b^2c^2)=4(ab+ac+bc)^2$$
$$a^4+b^4+c^4=4(ab+ac+bc)^2-2(a^2b^2+a^2c^2+b^2c^2)$$
$$=4\{a^2b^2+a^2c^2+b^2c^2+2(a^2bc+ab^2c+abc^2)\}-2(a^2b^2+a^2c^2+b^2c^2)$$
$$=2(a^2b^2+a^2c^2+b^2c^2)+8(a^2bc+ab^2c+abc^2)$$
$$=2\{a^2b^2+a^2c^2+b^2c^2+2(a^2bc+ab^2c+abc^2)\}+4(a^2bc+ab^2c+abc^2)$$
$$=2(ab+ac+bc)^2+4abc(a+b+c)$$
But $a+b+c=0$,
$\therefore 4abc(a+b+c)=0$.
$\therefore a^4+b^4+c^4=2(ab+ac+bc)^2$.

Note.—In 1st query in Geometry in our last issue, the word 'greater' should have been 'less.'

11. PAX.—Out of 126 feet of deal three cubical boxes of different sizes are made to contain 73 solid feet; the sum of their depths is 7 feet. Find the depth of each.

Let x, y, z = depths of the boxes in feet;
The surfaces of the boxes = 126 square feet; and surface of each box = 6 times square of depth.

$$\therefore \left.\begin{array}{ll}(1)\ x+y+z & =7\\ (2)\ 6(x^2+y^2+z^2) & =126\\ (3)\ x^3+y^3+z^3 & =73\end{array}\right\}$$
$$\left.\begin{array}{ll}(1)\ x+y+z & =7\\ (2)\ x^2+y^2+z^2 & =21\\ (3)\ x^3+y^3+z^3 & +73\end{array}\right\}$$
$$(1)\ (x+y+z)^2=7^2$$
$$x^2+y^2+z^2+2xy+2xz+2yz=49$$
$$(2)\ \underline{x^2+y^2+z^2=21}$$
$$2xy+2xz+2yz=28$$
$$(4)\quad xy+xz+yz=14$$
$$(1)\ \{(x+y)+z\}^3 = 7^3$$
$$(x+y)^3+3(x+y)^2z+3(x+y)z^2+z^3=343$$
$$x^3+3x^2y+3xy^2+y^3+3x^2z+6xyz+3y^2z+3xz^2+3yz^2+z^3=343$$
$$(3)\ \underline{x^3+y^3+z^3 = 73}$$
$$3x^2y+3xy^2+3x^2z+6xyz+3y^2z+3xz^2+3yz^2=270$$
$$x^2y+xy^2+x^2z+2xyz+y^2z+xz^2+yz^2=90$$
$$x(xy+xz+yz)+y(xy+xz+yz)+z(xy+xz+yz)-xyz=90$$
$$(x+y+z)(xy+xz+yz)-xyz=90$$
From (1) and (4) $7\times 14-xyz=90$
$$-xyz=-98-90$$
$$(5)\quad \therefore \underline{xyz=8.}$$

The sums of the Nos., of their squares, and of their cubes are integers;

$\therefore$ The Nos. are integers.

The three different integers multiplied together to give 8 are 1, 2, and 4.

$\therefore$ Depths of boxes = 1, 2, and 4 feet respectively.

Or, we can form a cubic equation with one unknown quantity, and obtain the solution.

$$(4)\ xy+xz+yz=14$$
$$x(y+z)+yz=14$$
$$\text{But, } y+z=7-x\ (1)$$
$$\text{And, } yz=\frac{8}{x}\quad (5)$$
$$\therefore x(7-x)+\frac{8}{x}=14$$
$$7x^2-x^3+8=14x$$
$$x^3-8-7x^2+14x=0$$
$$(x^3-8)-7x(x-2)=0$$

This will divide by $(x-2)$.

$$\therefore x^2+2x+4-7x=0$$
$$x^2-5x=-4$$
$$x^2-5x+(\tfrac{5}{2})^2=\tfrac{25}{4}-4$$
$$=\tfrac{9}{4}$$
$$x-\tfrac{5}{2}=\pm\tfrac{3}{2}$$
$$x=\pm\tfrac{3}{2}+\tfrac{5}{2}$$
$$\therefore x=1 \text{ or } 4.$$

And from $x-2=0$, we obtain $x=2$.

$\therefore$ Depth of boxes = 1, 2, and 4 feet respectively.

12. DON.—A person being asked to dispose of a fine horse, said he would sell him on receiving ¼d. for the first nail in his shoes, ½d. for the second, 1d. for the third, and so on, the number of nails being 32; what would the horse be sold for?

We require the sum of a geometrical series, where first term = 1, ratio = 2, and No. of terms = 32.

$$S=\frac{a(r^n-1)}{r-1};$$
$$\therefore \text{Amount}=\left(\frac{1\times(2^{32}-1)}{2-1}\times\frac{1}{960}\right)£$$
$$=\frac{4294967296-1}{960}£$$
$$=\underline{£4,473,924\ 5s.\ 3\tfrac{3}{4}d.}$$

13. HELPLESS.—Required the amount of ¼d. at 3 per cent. per annum, compound interest, in 18½ centuries. (*Wormell's* 'Arithmetic.')

(This question must be worked by Logarithms, and we have therefore included it under Algebra.)

Let P be the principal in pounds, n the number of years, R the amount of one pound in one year, and M the amount.

$$\therefore M=PR^n.$$
$$\therefore \text{Amount}=\{\tfrac{1}{960}\times(1{\cdot}03)^{1850}\}£$$
$$\log.\ 1{\cdot}03={\cdot}0128372247$$
$$1850$$
$$6418612350$$
$$1026977976$$
$$128372247$$
$$23{\cdot}7488656950$$
$$\log.\ \tfrac{1}{960}=\log.\ {\cdot}0010416\dot{6}=\ 3{\cdot}0177287$$
$$20{\cdot}7665943950$$
$$=\log.\ 584,244,134,000,000,000,000.$$
$$\therefore \text{Amount}=\underline{£584,244,134,000,000,000,000.}$$

Note.—The logarithm of 1·03 is taken to 10 decimal places; the more places taken, the greater and more accurate will be the answer.

14. D. T.—Simplify:—$\dfrac{a-b}{a^{\frac{1}{3}}-b^{\frac{1}{3}}}-\dfrac{a+b}{a^{\frac{1}{3}}+b^{\frac{1}{3}}}$.

$$\frac{a-b}{a^{\frac{1}{3}}-b^{\frac{1}{3}}}-\frac{a+b}{a^{\frac{1}{3}}+b^{\frac{1}{3}}}$$
$$=\frac{(a-b)(a^{\frac{1}{3}}+b^{\frac{1}{3}})-(a+b)(a^{\frac{1}{3}}-b^{\frac{1}{3}})}{(a^{\frac{1}{3}}-b^{\frac{1}{3}})(a^{\frac{1}{3}}+b^{\frac{1}{3}})}$$
$$=\frac{a^{\frac{4}{3}}+ab^{\frac{1}{3}}-a^{\frac{1}{3}}b-b^{\frac{4}{3}}-(a^{\frac{4}{3}}-ab^{\frac{1}{3}}+a^{\frac{1}{3}}b-b^{\frac{4}{3}})}{a^{\frac{2}{3}}-b^{\frac{2}{3}}}$$
$$=\frac{a^{\frac{4}{3}}+ab^{\frac{1}{3}}-a^{\frac{1}{3}}b-b^{\frac{4}{3}}-a^{\frac{4}{3}}+ab^{\frac{1}{3}}-a^{\frac{1}{3}}b+b^{\frac{4}{3}}}{a^{\frac{2}{3}}-b^{\frac{2}{3}}}$$
$$=\frac{2ab^{\frac{1}{3}}-2a^{\frac{1}{3}}b}{a^{\frac{2}{3}}-b^{\frac{2}{3}}}$$
$$=\frac{2a^{\frac{1}{3}}b^{\frac{1}{3}}(a^{\frac{1}{3}}-b)^{\frac{1}{3}})}{a^{\frac{2}{3}}-b^{\frac{2}{3}}}$$
$$=\underline{2a^{\frac{1}{3}}b^{\frac{1}{3}}}.\ \text{Ans.}$$

General.

1. SCHOLARSHIP EXAMINATION.—You are 'permitted' to take both, and 'expected' to do your best at each. The Latin extracts are not in any prescribed author.

2. A CANDIDATE will get only mechanical help from any work on composition; but even this may be valuable to him. *Dr. Morris's* 'Grammar' and *Dr. Abbot's* 'Hints' will be useful. Read *Gladman's* 'Notes on School Management,' *Collins's* 'Physiography' and *Dr. Wormwell's* 'Mechanics.'

3. SCHOLARSHIP.—The second fraction should be $\frac{4x}{x^2-4}$ not $\frac{4}{x^2-4}$, and as x is common to both numerators, the expression $= \frac{x}{x-2} \div \frac{4}{x^2-4} = \frac{x(x+2)}{4}$.

The 2 and 4 only are cancelled, as the printers (not having the necessary type) could not show x (or the whole quantity) cancelled in each case. It would therefore have been better to have given (x^2-4) in factors.

3. RECUERDO is informed that no text-books are prescribed by the Department for use in the training-colleges. The subjects only are prescribed. It would therefore be impossible to name the books referred to. If he contemplates entering any college, the principal would probably give him advice. *Gill's* 'School Management,' *Gladman's* 'Notes,' and *Bright's* 'History' (Rivington's, 7s. 6d.), will serve his special purpose.

4. R. G. W. DAVIS.—The examination to which you refer will not serve you in entering a Church training-college. Send to the principal for a prospectus, which will include the terms. The 'Teacher's Assistant' is published by Stewart and Co., Farringdon Street, E.C.

5. T. PENNOCK.—To have sole charge of a school not exceeding sixty in average attendance, a teacher must be at least provisionally certificated [Art. 52 and 93 (*a*)]. A qualification 'under Art. 79, Old Code,' will not suffice.

6. CYNTHIA.—Mental arithmetic is given to First Year candidates only.

7. BIRDIE.—The method of unity is commended. We do not know that an accurately-worked 'sum' on another method would have less marks.

8. C. WOODS will find in Schedule VI. that no pupil-teacher is released from service until his 'time' has expired, unless he enters a training-college, and for this he must have the consent of his managers. By comparing Articles 49, 50, 51, and 118 (*a*), it will be seen that no candidate who passes at the Admission Examination lower than the second class may be proposed as a Queen's Scholar; but all who 'pass satisfactorily' may be employed as assistants. The passage referred to is clearly not quite accurate.

9. J. EDWARDS.—'Civil Service Précis Book' (Crosby Lockwood); *Clyde's* 'Geography.'

10. UNLEARNED.—*Nicholson's* 'Zoology,' 3s. 6d., or 14s. (Blackwood); *Fawcett's* 'Political Economy,' 2s. 6d.; *Holland's* 'Jurisprudence,' 10s. 6d. (Clarendon Press); *Williams'* 'Oceans,' 2s. 6d. (Philip), Moffatt and Paige's, 9d.; *Curwen's* (old or new notation) 'Music.'

11. SOLICITOR. — Wrack = *wreck:* disaster, ruin. Stake = *pledge—i.e.*, if he struck the mark he would secure liberty. Strain (almost obsolete) = race, descent. Grey brothers = dressed in grey: Greyfriars.

12. B.A.—In addition to Bain, read *Sully's* 'Illusions,' etc., *Jevons's* 'Logic,' and consult Sir Wm. Hamilton's works.

13. SHERWOOD.—Your query is under consideration.

14. G. H. HARKER.—Please repeat your question, as we believe you have copied it incorrectly.

15. A SUBSCRIBER will find two lessons on 'Longitude and Latitude' in our recent issues. Almost every work on 'Physical Geography' or 'Physiography' treats on this subject. It is clearly explained in *Langley's* 'Popular Astronomy.'

Arithmetic.

1. A. M.—There is a circular field, a mile in circumference, and L, M, and N start together at one point in the circumference to travel round it in the same direction, at the respective rates of 84, 104, and 144 yards per minute. How soon will the three be together again? (*Colenso.*)

M gains on L (104 − 84) yds. per min.
= 20 yds. per min.;
N ,, ,, M (144 − 104) yds. per min.
= 40 yds. per min.;
M gains a round on L in (1760 ÷ 20) min.
= 88 min.;
N ,, ,, ,, M ,, (1760 ÷ 40) min.
= 44 min.;
∴ L and M are together every 88 min.,
M ,, N ,, ,, ,, 44 min.;
∴ They will be together in 88 min.

2. HAMLET.—Find the value of

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{2}}}}}.$$

(*Merrifield's* 'Technical Arithmetic.')

$$1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{2}}}}}$$

$$=1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1\frac{1}{2}}}}}$$

$$=1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{2}{3}}}}$$

$$=1+\cfrac{1}{1+\cfrac{1}{1+\frac{3}{5}}}$$

$$=1+\cfrac{1}{1+\frac{5}{8}}$$

$$=1+\frac{8}{13}$$

$$=1\tfrac{8}{13}, \text{ or } \tfrac{21}{13}. \text{ Ans.}$$

3. REX.—A man after a tour in Switzerland found that he had spent every day half as many shillings as the total number of days he had been from home. His tour cost £57 12s. How many days did it occupy? (*Cambridge Local* (*Junior*), 1882.)

Amount spent daily × No. of days = £57 12s.
1s. × ½ No. of days × No. of days = 1,152s.
½ No. of days × No. of days = 1,152
No. of days × No. of days = 1,152
(No. of days)² = 2,304
∴ No. of days = $\sqrt{2,304}$
= 48.

4. STONO-BONO.—I sell out of the 3 per cents. at 96, and invest the proceeds in railway 5 per cent. stock at par; find by how much per cent. on the stock bought my income is increased. (*Hamblin Stock.*)

Income per cent. on stock bought in 1st case = £3;
,, ,, this stock in 2nd ,, = £$(5 \times \frac{96}{100})$
= £4½;
∴ Increase of income per cent. on stock bought = £4½ − £3
= £1½.

5. COUSIN JACK.—Divide £36 8s. in four parts, such that their simple interests for 4, 6, 7, and 10 months at 3, 4, 5, and 6 per cent. per annum respectively shall be equal. (*Teachers' Assistant.*)

$3 \times \frac{1}{3}$, $4 \times \frac{1}{2}$, $5 \times \frac{7}{12}$, $6 \times \frac{5}{6}$
= 1, 2, $\frac{35}{12}$, 5;

∴ The parts must be in the proportion of the reciprocals of those numbers, that is, of 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$;

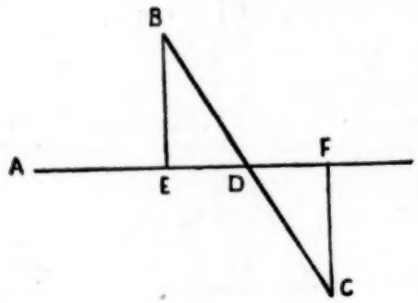
$$\text{Sum} = \frac{70+35+24+14}{143} = \frac{143}{70};$$

∴ First part = £36 8s. $\times \frac{70}{143}$
= £2 16s. $\times \frac{70}{143}$
= £$\frac{360}{143}$
= £17 16s. $4\frac{4}{11}$d.;
Second ,, = $\frac{1}{2}$ of 1st part
= £8 18s. $2\frac{2}{11}$d.;
Third ,, = $\frac{1}{3}$ of 1st part
= $\left(\frac{12}{35}\text{ of }\frac{198}{11}\right)$ £
= $\frac{360}{143}$ £
= £6 2s. $2\frac{2}{11}$d.
Fourth ,, = $\frac{1}{4}$ of 1st part
= £3 11s. $3\frac{3}{11}$d.

Note.—Your writing is pretty fair, but it is not straight. You must remedy that defect before applying for a clerkship.

Geometry.

1. ENQUIRER.—Through a given point draw a straight line, such that the perpendiculars on it from two given points may be on opposite sides of it and equal to each other.



Let A be the given point through which the straight line is to be drawn, and B and C the other given points.

Construction.—Join BC, and bisect it in D. Join AD.

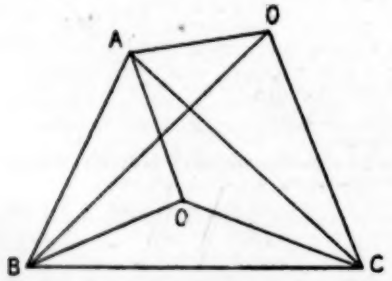
Then, AD produced shall be the required straight line.

Proof.—Draw BE and CF perpendicular to AD, and AD produced.

In the triangles BDE, CDF,

∠BDE = ∠CDF, (I. 15.)
∠BED = ∠CFD, (Ax. 9.)
and side BD = side CD; (Con.)
∴ side BE = side CF. (I. 26.) Q. E. F.

2. PUPIL TEACHER.—The sum of the distances of any point from the three angles of a triangle is greater than half the sum of the sides of the triangle. (*Todhunter.*)



Let ABC be a triangle, and O a point either within or without it.

Join OA, OB, OC.

Then, the sum of OA, OB, OC shall be greater than half the sum of AB, BC, CA.

Proof.—OA and OB are > AB, (I. 20.)
OB and OC are > BC,
OC and OA are > CA;
∴ Twice sum of OA, OB, OC is > sum of AB, BC, CA;
Wherefore, sum of OA, OB, OC is > half the sum of AB, BC, CA.
Q. E. D.

Mensuration.

1. BLACKBOARD.—The radius of a circle is one foot: find the area of a regular polygon of eight sides inscribed in the circle. (*Todhunter.*)

$$\text{Area of polygon} = \frac{n}{2} R^2 \sin\frac{2\pi}{n},$$

where n = No. of sides, R = radius of circumscribed circle, and 2π = 4 right-angles;

∴ Area of octagon = $(\frac{8}{2} \times 1^2 \times \sin\frac{360°}{8})$ sq. ft.
= $(4 \times \sin 45°)$ sq. ft.
= $\left(4 \times \frac{1}{\sqrt{2}}\right)$ sq. ft.
= $2\sqrt{2}$ sq. ft. Ans.

2. J. EDWARDS, Burton-on-Trent.—A cylindrical stone pillar, which weights 15 cwt. 84 lbs., is to be replaced by two cylindrical iron pillars of the same length, and having each half the circumference of the stone pillar: if 288 cubic inches of iron weigh the same as half a cubic foot of the stone, find the weight of iron required. (*Lower Division*, May, 1881.)

Solidity of cylinder = base × height
= (circumference)² × ·07958 × height.
∴ Solidity of an iron pillar = $\frac{1}{4}$ solidity of stone pillar,
,, ,, iron pillars = $\frac{1}{2}$ solidity of stone pillar.
288 cub. in. of iron weigh as much as 864 cub. in. stone,
1 ,, ,, weighs ,, 3 ,, ,, ;
∴ Weight of iron required = $\frac{15 \text{ cwt. } 84 \text{ lbs.} \times 3}{2}$
= $\frac{15\frac{3}{4} \text{ cwt.} \times 3}{2}$
= $23\frac{5}{8}$ cwt.
= 23 cwt. 70 lbs. Ans.

3. ROGO.—The diagonals of 3 squares are 16, 32, and 48 feet. Compare their areas.

(Diagonal of a square)² = 2 side²;
Area of a square = side²;
∴ ,, ,, ,, = $\frac{1}{2}$ diagonal².
Area of 1st square = $(\frac{1}{2} \times 16^2)$ sq. ft.
= 128 sq. ft.;
,, 2nd ,, = $(\frac{1}{2} \times 32^2)$ sq. ft.
= 512 sq. ft.;
,, 3rd ,, = $(\frac{1}{2} \times 48^2)$ sq. ft.
= 1152 sq. ft.

∴ Area of 1st : area of 2nd : area of 3rd :: 128 sq. ft. : 512 sq. ft. : 1152 sq. ft.
:: 128 : 512 : 1152
:: 1 : 4 : 9
or :: 1^2 : 2^2 : 3^2.

Or,

Area of 1st : area of 2nd : area of 3rd
:: $\frac{1}{2} \times 16^2$: $\frac{1}{2} \times 32^2$: $\frac{1}{2} \times 48^2$
:: 16^2 : 32^2 : 48^2
:: 16^2 : $(16 \times 2)^2$: $(16 \times 3)^2$
:: 1^2 : 2^2 : 3^2
or :: 1 : 4 : 9.

4. ARTHUR SCRASE.—A cubical vessel placed on a horizontal plane is tilted, until the liquor contained therein just covers the bottom, and reaches up the side of the vessel nearest to the angle resting on the plane, until it reaches $\frac{1}{2}$ of the distance measured from the bottom. What proportion of the vessel is filled? (*Civil Service*, 1881.)

Content of liquor = $\{(1 \times 1 \times \frac{1}{2}) \div 2\}$ of content of vessel
= $\frac{1}{4}$ content of vessel. Ans.

Notes on Bacon's Essays.

BY FRANCIS WATT, M.A.

ESSAY XLI.—OF USURY.

SUBSTANCE.

MANY men have spoken against usury, but it seems certain that it will always exist in some shape or other. It has disadvantages, but also some advantages, which are stated at length. The following plan is proposed for its regulation. There are to be two legal rates of interest: one at 5 per cent., the other a good deal higher; and this last is not to be general, but only allowed under certain stated conditions.

Usury [Lat. *usura* (from *utor*, I use)—use of money lent] now usually means high and exorbitant interest for money lent. In Bacon, it means any interest. As the taking of interest was denounced in the Pentateuch (Exod. xxii. 26; Lev. xxv. 35, 37), it came to be considered a crime by the Christian Church. Aristotle also condemned it for the extraordinary reason that money, being by nature barren, ought not to be made to produce more money. For centuries the taking of interest was forbidden, and all restrictions on this were only abolished at the beginning of the present reign.

Calvin declared against any restrictions on the lending of money for interest, and in 1724 Jeremy Bentham showed that the Usury Laws only made people who required to borrow pay at a high rate for the accommodation, since the lender had to be recompensed for the risk he ran in breaking the law; whilst it hampered the development of commerce by putting restrictions in the way of the mercantile borrower. The rate of interest is now presumed to be 5 per cent. where no rate is mentioned; but the increase of wealth, and the greater security and ease of mercantile transactions in our own time, has made the usual actual rates for borrowing very much lower than they were in Bacon's day. Mr. Ruskin is the only eminent living writer who opposes the exaction of interest for money lent, and in his *Fors Clavigera* and elsewhere he has made many 'witty invectives' against it.

witty invectives, clever attacks (invective, L. *inveho*, I go against).

tithe, 10 per cent. was then a common rate of interest. The tenth was God's part, since it was the part devoted to the support of the priesthood both under the Mosaic and Christian dispensations.

his plough goeth every Sunday. If money is lent, interest is charged for it according to the time, in which counting, Sundays are enumerated as well as week-days.

Ignavum fucos, etc. 'They drive from their dwellings the drones, a lazy set.' From the 'Georgics,' a poem on agriculture, by Virgil, the famous Roman poet.

in sudore, etc., 'in the sweat of thy brow thou shalt eat thy bread, not in the sweat of another's brow.'

orange-tawny dresses. In the Middle Ages the Jews were not only compelled to live in a certain quarter, but to carry a yellow badge or head-dress.

to Judaize, to act like a Jew.

money to beget money. As in the opinion of Aristotle, already referred to; usury is eloquently denounced in the 'Merchant of Venice' on the same ground.

concessum propter, etc. 'A concession on account of the hardness of the heart' (Matt. xix. 8).

as = that, a common use with Elizabethan writers.

freely, viz., without interest.

suspicious and cunning propositions of banks, plans for companies to lend money. There were then no banks in England, though they had existed in Venice since the twelfth century. Bacon looked on propositions to establish them as cunning devices to benefit the authors.

discovery of men's estates, open proclamation of a man's means, to show how much he was worth, and so prevent his unlawfully increasing his wealth by usury.

usefully, in a practical, sensible way.

weighed out or called out, estimated or carefully gathered.

make forth, proceed.

makes fewer merchants. This is not the case. Credit (which is a form of usury) enables the capital of a country to be placed at the disposal of those who are able to use it; but in Bacon's time banks, the great machinery for doing so, did not exist.

upon merchandising, in commerce, a verbal abstract noun.

vena porta, the great canal that carries the blood after it has been renewed to the liver.

husband, not merely cultivate, but cultivate or employ with profit. In our author's 'History of Henry VII.' he talks of the French as 'wisely husbanding the possession of a victory.'

sit, occupy or have his farm.

incident to, the result of, caused indirectly by the others.

customs, the revenue which is chiefly derived from commerce.

which, viz., the customs.

will be in the box, will be in the possession of the usurer. So in the gaming-tables at Monaco, the chances are so arranged as to give a slight advantage to the bank, which, in the long run, is always a gainer. Bacon thinks there is something of the same in the case of the usurer.

purchasing, viz., of land. It is not necessary to a country's welfare, or a sure sign of it, that the price of land should be high. This may be caused by over-population, as well as by great wealth.

waylays both, prevents both. As already shown, this is not true.

slug, viz, makes others sluggish; scarcely a slug itself. A name is given to the cause from its effect.

canker and ruin, the interest eats up all their income.

driven, carried on.

as = that.

stand, stoppage.

undoing, destruction.

far under foot, much below their value.

bad markets, they cannot wait for a favourable time to realise a proper value, but must just take what they can get.

pawns, pledges.

use, profit.

precisely, exactly, they will take full advantage of the conditions.

forfeitures of mortgages and bonds. When money is lent on the security of lands or houses, legal documents called *mortgages* and *bonds* are granted to secure it, and if the conditions are not kept, the holder of these documents can seize the property. (*Mortgage*: Fr., *mort gage*, dead pledge.)

a vanity, absurdity.

cramped, restrained.
rate, degree.
Utopian, nowhere (Gr. *ou*, not; and *topos*, a place), the name of a famous romance of Sir Thomas More, the Lord Chancellor of Henry VIII., and friend of Erasmus, which tells of an island where the institutions were perfect.
reglement, regulation.
tooth of usury be grinded, that the usurer be not allowed to exact too much.
ease, relieve.
to seek, at a loss.
to serve both intentions, to accomplish both ends.
shut itself out, preclude itself from taking.
dryness, want.
infinite borrowers, a very large number of borrowers.
will yield six in the hundred and somewhat more, 6½ per cent., viz., the sixteenth part of 100. Land, as an investment, does not *now* pay half this interest.
edge, urge on.
caution, condition.
more easy, lower.
shall, we should here say will. There are many examples in Shakespeare of this usage.
stock, capital. Adam Smith, in the 'Wealth of Nations,' always calls capital *stock*.
they will hardly be brooked. Bacon considers, on the whole, that the disadvantages of banks are greater than their advantages.
answered some small matter, allowed a trifle.
gains of hazard, as those of trade.
colour other men's monies, to get money from other men and lend it, pretending it is their own.
send his money far off. English capital had not yet gone forth into every corner of the world.
declaration, defining exactly how far it is allowed.
connivance, pretending to take no notice.

Bacon's plan is ingenious, but quite impracticable. The principle that all such matters ought to be left to regulate themselves was one that, seemingly, did not occur to statesmen of the period.

(*To be continued.*)

—o—

Music.

BY RALPH DUNSTAN, MUS. BAC., CANTAB.;
L. MUS., T.C.L.;
Member of the Council of the Tonic Sol-fa College, etc.

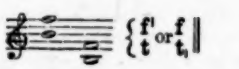
(Continued from page 243.)

FIFTHS, PERFECT AND IMPERFECT.—An interval of a 'fifth' comprises *five* notes or letter-names, as C to G (C, D, E, F, G), or d to s (d, r, m, f, s).

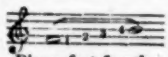
There are two kinds of fifth found in the Common Scale, viz., *perfect*, comprising three major seconds and one minor second, or *seven* semitones, and *imperfect* or *diminished*, comprising two major seconds and two minor seconds, or *six* semitones. The interval of a fifth is very closely related to that of a fourth, as you will see later on. You will remember that all the fourths in the scale, except *one*, are perfect; and, similarly, all the fifths, except *one*, are perfect.

TABLE OF FIFTHS.—'*Six*' *perfect* fifths, comprising three major seconds and one minor second, or *seven* semitones:—

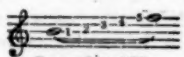
'*One*' *imperfect* or *diminished* fifth, comprising two major seconds and two minor seconds, or *six* semitones:—



'Imperfect' means 'less than perfect.' Observe that the pluperfect fourth and the imperfect fifth are identical as to the number of semitones, each containing *six*, but the pluperfect fourth occupies only *four* degrees of the scale (or four letter-names, F, G, A, B), while the imperfect fifth occupies *five* degrees (or five letter-names, B, C, D, E, F).

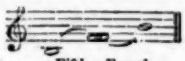


Pluperfect fourth: *six* semitones, *four* degrees of scale.



Imperfect fifth: *six* semitones, *five* degrees of scale.

These intervals added together make a complete octave, from B to B, or from F to F—



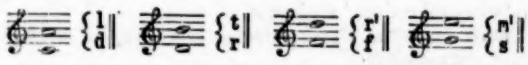
Fifth. Fourth.

Fourth. Fifth.

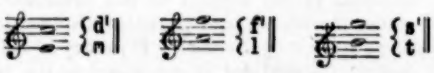
SIXTHS, MAJOR AND MINOR.—An interval including *six* letter-names is called a *sixth*. A *major* sixth comprises four major seconds and one minor second, or *nine* semitones, as from C to A or d to l.

A *minor* sixth comprises three major seconds and two minor seconds, or *eight* semitones, as E to C or m to d.

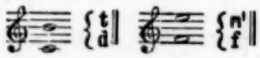
TABLE OF SIXTHS.—*Four* major sixths, comprising four major seconds and one minor second—*nine* semitones.



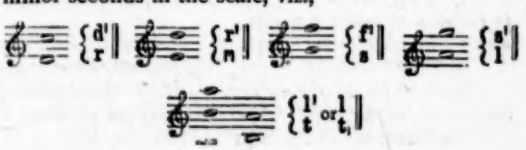
Three minor sixths, comprising three major seconds and two minor seconds—*eight* semitones.



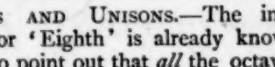
SEVENTHS, MAJOR AND MINOR.—A *major* seventh comprises five major seconds and one minor second, or *eleven* semitones. There are *two* major sevenths in the Common Scale, viz.,



A *minor* seventh comprises four major seconds and two minor seconds, or *ten* semitones. There are *five* minor seconds in the scale, viz.,

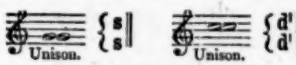


OCTAVES AND UNISONS.—The interval of an 'Octave' or 'Eighth' is already known; it will be sufficient to point out that *all* the octaves of the scale are *perfect*, and contain five major seconds and two minor seconds, or *twelve* semitones.



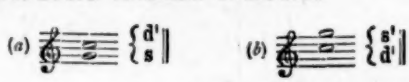
&c.

When two voices or instruments produce the *same* tone (or note) they are said to be in 'unison.' For the sake of completeness the 'unison' is often called an 'interval.' All the 'unisons' (like the octaves) are perfect, and, of course, contain *no* semitones.

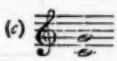


&c.

INVERSION OF INTERVALS.—If the *lower* note of any interval be *raised an octave* while the higher remains as before, or if the *higher* note of any interval be *lowered an octave* while the lower remains as before, the interval is said to be 'inverted' (literally 'turned upside down'), and the *new* interval thus produced is said to be the 'inversion' of the first.



(*b*) Inverted by writing the lower note an octave higher.



(*c*) Inverted by writing the higher note an octave lower.

Here you observe that the inversion of (*a*), a perfect *fourth*, is (*b*) or (*c*), a perfect fifth; or, in other words, a *fourth* by 'inversion' becomes a *fifth*.

By subtracting the 'number' of any interval from NINE we get the 'number' of its inversion; thus, as we have seen: *four* from nine, *five;* the inversion of a *fourth* is a *fifth*, and the inversion of a *fifth* is a *fourth*. Similarly, the inversion of a *second* is a *seventh* (2+7), the inversion of a *third* is a *sixth* (3+6), etc.

Verify this for yourself by writing out the inversions of several intervals.

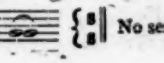
The *quality* of an interval is strangely affected by inversion. Thus:—

a *Major*	interval when inverted	becomes a	*Minor*	interval
a *Minor*	,,	,,	,,	a *Major*	,,
an *Augmented*	,,	,,	,,	a *Diminished*	,,
a *Diminished*	,,	,,	,,	an *Augmented*	,,
a *Pluperfect*	,,	,,	,,	an *Imperfect*	,,
an *Imperfect*	,,	,,	,,	a *Pluperfect*	,,

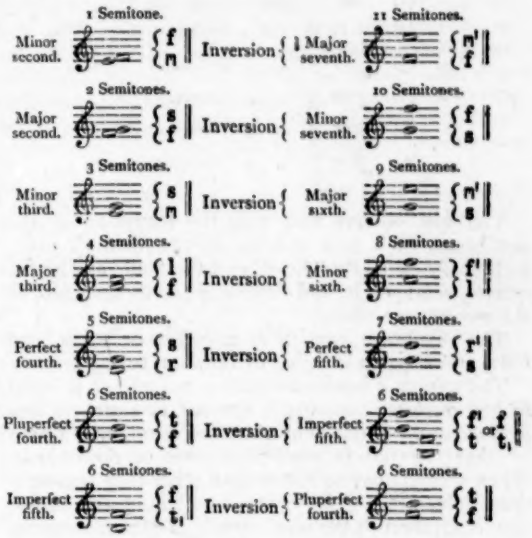
But a *Perfect* interval when inverted produces another *Perfect* interval: this distinguishes 'perfect' intervals from all others.

A complete table of intervals found in the Common Scale, with an example of each, its inversion, and the number of included semitones is now given for revision and reference.

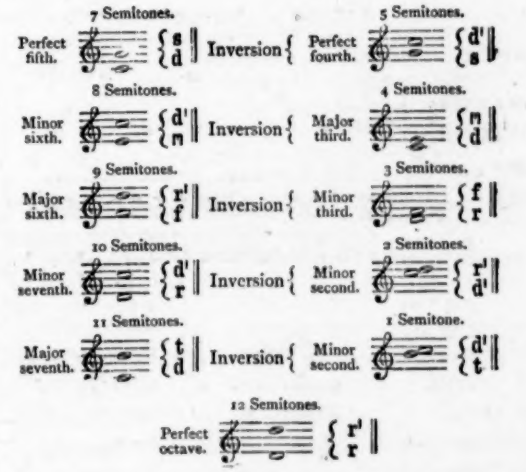
COMPLETE TABLE OF DIATONIC INTERVALS.—



The unison is, strictly speaking, *not* an interval, and cannot therefore be inverted; some writers, however, speak of the octave as the inversion of the unison.



N.B.—The imperfect fifth is also called a 'diminished' fifth, and the pluperfect fourth an 'augmented' fourth or 'tritone.'



I have used the word 'diatonic' (*through* the *tones*) at the head of this table, which means 'consisting of the notes of the scale' without *inflections* (sharps or flats). When a note is *inflected* or changed in pitch by an accidental sharp or flat, if is said to be 'chromatic' (coloured). Thus in the common scale of C, the notes C, D, E, F, G, A, and B, are *diatonic*, while C♯, B♭, etc., are *chromatic*.

Intervals formed by the addition of *chromatic* notes will be investigated in a later chapter.

LENGTH OR DURATION OF SOUNDS.—We have seen that the *pitch* of a note is determined *absolutely* by its position on the staff, and *relatively* by its relation to the Tonic. The *duration* of a note is determined by its *shape* in staff notation, and by the addition of certain signs in Solfa.

TIME IN STAFF NOTATION.—In modern music *six* kinds of notes are commonly employed :—

(1) called a Semibreve.
(2) or „ „ Minim.
(3) or „ „ Crotchet.
(4) or „ „ Quaver.
(5) or „ „ Semi-quaver.
(6) or „ „ Demi-semi-quaver.

You will observe that with the exception of the semibreve, each note consists of two distinct parts, technically called the 'head' and the 'tail,' and for the quaver, semiquaver, and demisemiquaver, one, two, or three *crook*s are added.

The semibreve consists of a *hollow* or *white* head only, and is equal in value of duration to *two minims*

The minim, a semibreve with a tail added is equal to *two crochets;* similarly a crochet is equal to *two quavers*, etc. It does not affect the duration of a note whether the tail is turned upwards or downwards. When several quavers follow each other they are sometimes joined, ; the line joining the tails is then equivalent to the one crook. If semiquavers are connected *two* lines are employed, ; and for demisemiquavers *three* lines,

TABLE OF NOTES.

1 Semibreve		is equal to
or 2 Minims		
or 4 Crotchets		
or 8 Quavers		
or 16 Semiquavers		
or 32 Demisemiquavers		

English Name.	German Name.	French Name.
Semibreve.	*Whole* note.	Ronde (round).
Minim.	*Half* note.	Blanche (white).
Crotchet.	*Quarter* note.	Noire (black).
Quaver.	*Eighth* note.	Croche (crooked).
Semiquaver.	*Sixteenth* note.	Double croche.
Demisemiquaver.	*Thirty-second* note.	Triple croche.

Sometimes, as in many of Handel's Choruses, a note called a breve, or , is employed, and is equal to two semibreves.

A *dot* placed after any note lengthens its value by *one-half;* thus :—

A *dotted*	semibreve	·	is equal to a		and a		
„	„	minim	·	„	„		„	
„	„	crotchet	·	„	„		„	
„	„	quaver	·	„	„		„	
„	„	semiquaver	·	„	„		„	

Two *dots* (or a *double dot*) placed after a note lengthens its value by *three-quarters.*

A *double-dotted*	semibreve	··	is equal to a		and a		and a
„	„	minim	··	„	„		„	
„	„	crotchet	··	„	„		„	
„	„	quaver	··	„	„		„	

Occasionally *three* notes of *equal* value are written to be performed in the time of *two* of the same kind, a figure three being placed over or under the group, which is then called a *triplet.*

TRIPLETS.

... ... equal ... ...
... ... „ ... ...
... ... „ ... ...
... ... „ ... ...
... ... „ ... ...
... ... „ ... ...

(To be continued.)

Erratum.—P. 242, second column,
For TABLE OF FOURTHS.—'*Six*' *perfect* fourths, comprising three major seconds, or *six* semitones :—
read :—TABLE OF FOURTHS.—'*Six*' *perfect* fourths, comprising two major seconds and one minor second, or *five* semitones.

Science Notes.

THE GROCERS' COMPANY AND SANITARY SCIENCE.—The Grocers' Company have recently announced their intention of offering every four years a prize of £1000 for discoveries in sanitary science. They have appointed a scientific committee to act with the Court in awarding this amount, and as this body includes Drs. Tyndall and Buchanan, and Professor Burdon-Sanderson, there is reason to hope that valuable contributions to the subject will be sent in for competition. The first award will be made in the early part of the year 1887, the papers having to be submitted not later than December 31st, 1886. The subject that has been selected for the first competition is the following problem :—'To discover a method by which the vaccine contagium may be cultivated apart from the animal body, in some medium or media not otherwise zymotic, the method to be such that the contagium may by means of it be multiplied to an indefinite extent in successive generations, and that the product after any number of such generations shall (so far as can within the time be tested), prove itself of identical potency with standard vaccine lymph.' Competition is not restricted to English scientists, but is thrown open universally.

* * * * *

PROFESSOR HUXLEY ON EVOLUTION.—At Cambridge this year the delivery of the Rede lecture devolved upon Professor Huxley, and the subject selected by him was : 'The origin of the existing forms

of animal life, construction, or evolution?' The lecture was given in the Senate House on Wednesday, June 12th, in the presence of a large and distinguished company, including the Duke of Devonshire, Chancellor of the University. The professor in dealing with the subject, selected one form of animal, claiming that conclusions that could be fairly drawn from it were also applicable to all others. The animal which served as the foundation of his arguments was the Pearly Nautilus. Giving a comprehensive description of the animal as far as bore upon his train of reasoning, and dwelling particularly on the peculiarities of its shell, he passed on to describe its development from the egg. This he traced stage by stage, showing how from the almost structureless ovum the perfect animal was gradually evolved. Having proved that evolution was thus existing in the history of the individual, he proceeded to apply the same theory to the history of the species. He showed that the history of the species as gathered from long series of fossil forms, extending through all the strata above the Silurian, was repeated in the life history of each individual, as shown in the different stages of its development. From this he passed to consider the other hypothesis possible, viz., that of construction, against which he argued with considerable power. Finally, he dealt with the objections to the theory of evolution, and then the conclusion that the work of the past twenty years, and the investigations made during that time into the history of all other forms of animal life, pointed irresistibly to the conclusion that the different species met with through the long ages of geological time were not each a separate creation, but that the later ones were developed from those that had preceded them. The lecture was listened to throughout with the closest attention, and was most enthusiastically received. At its close the Duke of Devonshire expressed to the lecturer the thanks of those present.

* * * * *

RESEARCH AT OXFORD.—Following the example set by the sister University in establishing the Balfour Studentship, the friends of the late Professor Rolleston have subscribed a sum of £1,200, which they have offered to the University of Oxford, for the institution of a prize for original research in any subject comprised under the following heads: Animal and Vegetable Morphology, Physiology and Pathology, and Anthropology. The University has accepted the trust, and will award such a prize every two years.

* * * * *

PREVENTION OF RAILWAY COLLISIONS.—From Pittsburg, Pennsylvania, we hear of the invention of a pneumatic railway signal, which the inventor, Mr. W. C. Beckwith, claims will be a positive prevention of railway collisions, and which is free from the objections brought against the various signals now in use. He divides the system into sections, each of which is entirely automatic. As the train passes into a section the signal is set both in front and in the rear. As it passes out of one section into the next, the signal approached remains set, the one passed resumes its position and the one in advance, about to be approached, is set. The signal is worked by the wheels passing over a lever which works an air-pump, and this drives air through pipes to the front and rear signal and the one passed over. No hands are required in working the signal and no flagmen are needed.

M. DE LESSEPS ON AFRICAN ENTERPRISE.—Lecturing recently on the scheme for converting the desert of Sahara into a vast inland sea, M. de Lesseps said that the evaporating power of the sun there is less than it is in the Red Sea, and that the fears of those who hold that if formed the Sahara Sea will dry up are unfounded. The cost of the necessary works is now estimated at 150 millions of francs, and the time needed for carrying out the work is estimated at five years. All that the projectors require is the concession of the lands which will form the shores of the lake.

* * * * *

THE ELECTRIC LIGHT ON SHIPBOARD.—It is reported that the Edison incandescent electric lamps are to be supplied to the new Guion liner *Oregon*, one of the fastest emigrant vessels afloat. The plant needed for the working of these will be two duplicate 500-light machines and engines. The practice of supplying large passenger steamers with electric lights is spreading, the advantages over oil lamps being obvious.

* * * * *

THE DANGERS OF RAILWAY CURVES.—At a recent meeting of the Institution of Civil Engineers, a paper was read by Mr. J. McKenzie on the resistance of railway curves as an element of danger. In it the author pointed out that, in the case of six-wheeled engines with parallel axles, there was generally a very narrow margin of safety as regards running off the rails. The side-pressure on the outer leading wheel of such engines when rounding a curve, he contended, was so great in certain cases as to cause the flange to adhere and mount the rail. Notwithstanding the fact that but few accidents have resulted from such a cause, the subject is well worth the attention of railway engineers.

* * * * *

ADULTERATION OF SILK FABRICS.—The depression under which the silk industry has long been suffering, in consequence of the great mortality that has for years prevailed among the silkworms, has at last been checked; and it is hoped that the practice of adulteration, which has crept in to cover the loss of production, may be put a stop to. The way has been made easy to those who practised adulteration by the preference given to different colours in the market. The yarn has been soaked in acetate of lead, and then, when dry, the hanks have been treated with sulphuretted hydrogen. In some cases 23 per cent. of sulphide of lead has been deposited. An antidote is now suggested which depends on feeding the worms with different leaves in different cases. The silk is so produced originally of the colour required, and the necessity for dyeing is obviated. Thus pale blue cocoons have been obtained by giving minute quantities of indigo with mulberry leaves; red ones by feeding the silkworms on the leaves of *Bignonia chica*. A particular variety of the vine gives rise to silk of a ruby colour, while the partial use of lettuce leaves produces a deep emerald-green. The subject is about to be taken up energetically in New Zealand, where the silk production is assuming great importance.

* * * * *

REMARKABLE AURORA BOREALIS.—A remarkable appearance of the aurora borealis recently was visible at Ludvika, in Sweden. It began as a faint band of

light parallel to the horizon, and gradually grew broader and broader. The extraordinary feature which it presented was that in this band of light most fantastic forms were seen. It took on the appearance which a lake covered with ice would present by moonlight. The promontories and shores were most distinct, the latter clothed in many places by trees. Even the faint outlines of farms could be traced by a fanciful imagination. The phenomenon lasted only about ten minutes, when it changed into a suffused pink luminosity, like clouds near a setting sun.

* * * * *

ERUPTION OF A LONG QUIESCENT VOLCANO.—Mount Karang, a volcano in the Straits of Sunda, which has been at rest for two hundred years, has recently burst into eruption. Shocks have been felt several miles away. The mountain is in the island of Krakatra, near Anjer, in the Straits of Sunda.

Publications Received.

Bell & Sons—
Supplementary Arithmetic. By the Rev. J. Hunter, M.A.

Blackie and Son—
Domestic Economy. By E. Rice.
Home Lesson Books.
First, Second, Third, and Fourth Readers.

Cambridge University Press Office—
General Aims of the Teacher, and Form Management. Two Lectures by F. W. Farrar, D.D., and R. B. Poole, B.D.

Cassell & Co. (Limited)—
Sports and Pastimes. Part XV., including Extra Sheets.

Chambers, W. and R.—
The Standard Arithmetical Exercises. By H. Allen.

Griffith and Farran—
Our Little Ones. Vol. III., No. 8. June.

Heywood (John)—
Gardiner's Home Lesson Book. Book 6, for Standard VI.
The 'Marvel' Writing Copy-Books. Nos. 5 to 9.
Action Songs for Children. By J. Clift Wade.

Houlston & Sons—
My Instructive and Amusing History of England. By H. Fuller.

Johnston (A.)—
Standard Mental Arithmetic, Cards IV. and V.
Mental Arithmetic Cards. 1s. Standards VI. and VII.
Lump of Chalk. By Alexander Watt.

Ledsham, J. B.—
King John.

Longmans and Co.—
Longman's Magazine. No. 8.
A Treatise on Navigation. By John Merrifield, LL.D., F.R.A.S., F.M.S.
Macaulay's Warren Hastings. By S. Hales.

Moffatt and Paige—
Punishment Book.

Nelson and Sons—
World at Home. Standard IV. 1s. 6d.

Porteus, R. J., & Co. (Newcastle-on-Tyne)—
Bowden's Pocket Code. By Charles Bowden.

Swan Sonnenschein & Co.—
The Musician.
Guide for Pianoforte Students. By Ridley Prentice.
Babies—How to Rear Them. By F. A. Fawkes, F.R.H.S.

The National Society's Depository—
Geography Reading Books. Standard IV.
English History Reading Books. Part V.

Verlag von Oswald Mutze (Leipzig)—
Geschichtsunterricht in Volksschulen und Soldatenwesen von Herm Molkenvoer.

Ward, Lock and Co.—
The Universal Instructor. Part XXXII.

Wood, R. (Bolton)—
The 'Analytic' Arithmetical Test Cards (Code 1882-83). Standards II. to VII.
The 'Analytic' Model Essays. Packet A.

Publications Reviewed.

Geography Reading Books. Part IV. for Standard IV. London: The National Society's Depository.

We have pleasure in recommending this book to the attention of all teachers who desire to introduce an interesting and well-written geographical reading book into their schools. It is clearly printed, serviceably bound, and well adapted for school use. The parts of the world dealt with are the British Isles and the British possessions in North America and Australasia, and the bright and happy admixture of instruction and anecdote in the descriptions of these lands cannot fail to make the book entertaining and attractive to the youthful reader. The illustrations are numerous and appropriate, and the maps—especially that of the Canadian Dominion, at the commencement of the volume—deserving of considerable praise.

English History Reading Books. Part V., for Standard VI. By Charlotte M. Yonge. London: National Society's Depository.

It is a treat to run through the pages of this reader, for, as may readily be imagined in a work by Miss Yonge, the style is bright and interesting, and the diction everything that could be desired. The book is intended to serve as a sequel to the four previous historical readers, and gives those details of the condition of English people from the earliest times up to the present day which could not well be given in those volumes. It treats on the progress of our civil institutions, our literature, and our manners in a way which not only calculated to interest young readers at the time of reading, but to instil into them a love of literature and a desire to hear more about the history of their native land. The book is fairly illustrated, and is brought out in a strong, serviceable manner.

The Empire Series of Historical Readers. Four Books. London: Jarrold and Sons.

The first of these four books, entitled 'Stories from English History for Standard III.,' is written by Mary Jacomb Wilkin, and is abridged from an earlier work by the same authoress, entitled 'Now and Long Ago.' The abridgment is well done, and the book is suitable for the standard for which it is intended. The remaining three books of the series have been arranged from a work which has been for many years favourably known to the public, viz., *White's* 'Landmarks of English History.' The books are well and clearly printed on good paper, and are serviceably bound. The illustrations call for no special mention; but, taken as a whole, the four books are carefully graduated, and merit considerable commendation.

The Oxford and Cambridge Date Card. London: John Marshall and Co., Paternoster Row.

This memory-card contains a vast amount of historical information, and will be found useful to all who are reading for an examination.

Sunday for our Little Ones. By E. M. Geldart, M.A. London: Swan Sonnenschein and Co.

We once heard a humble-minded clergyman offer to a poor lady, who couldn't sleep, a few of his own MS. sermons as most valuable narcotics. We doubt if this little volume would so act, as its contents are so written as to interest and engage the attention of all, both old and young.

The addresses are called unsectarian, and though we assume, from the fact, as the preface tells us, that they were delivered to children and others at monthly morning services, that the writer is a minister of religion—we should doubt if he is a clergyman of the Church of England.

If the third sermon on 'Eyes and no Eyes' were omitted, we have no hesitation in saying that the book would find its way into many more houses than it will. The other twelve sermons might be preached with great advantage to any body of children of any sect or church. They are full of just such teaching as children want, the sayings and exhortations of Jesus Christ being made applicable to children in their daily struggles with circumstances. One passage on Sulks we must quote. It is found in the sermon on 'Love one another,' one of the happiest efforts, as a whole, in the book. Here is the quotation: 'Do you know what it is to be in the sulks? I do very well. It is very disagreeable. It is very nasty to feel sulky; it is very nasty to look sulky. It is very unpleasant to look at another person who is sulky. But do you know what is most unpleasant of all? To be told when you know you are sulky, when you feel that you are sulky, when you hate yourself for being sulky, and perhaps just when you are casting about to think of something cheerful, and to recover your good humour, "Why, how sulky you look! What can be the matter?" I'll tell you what that's like. Suppose you had a sore place on your hand when the skin was rubbed off, and some kind friend came up to you and drew a rough file across it, and then sprinkled in a little pepper and salt, or a dash of vinegar. If you want to know how a sulky person feels when he is told he looks glum—just as if he didn't know it—only try that little experiment next time you have a chafed knuckle or knee. Oh, why can't we let each other alone! It would all come right in a few minutes if it wasn't for those restless, thoughtless little tongues of ours. Well then, in this way and in many other ways which I will not speak of now, I would have you cherish and take tender care of this love which you have to one another as the best of all heaven's gifts.' This is just the plain sympathetic teaching our children want and love.

In the third sermon the author has unfortunately taken a miracle from the Gospel narrative as the basis of his remarks. And we have no hesitation in saying that nine Christians out of every ten would, on 'discovering' it immediately discard the book as unfit for his children. In his preface the author says, 'The aim throughout has been to tell young people both what is right and why it is right, without appealing to dogmatic sanctions or dealing in theological refinements. The day is surely dawning for all, as it has already dawned for many, when some firmer basis for belief and practice must be sought by young and old than is furnished by Bible texts or ministerial authority.' Now, without this third sermon on the restoring sight to a blind man—or rather on all the miracles of the same nature—we should scarcely understand what this passage meant. The author begins this sermon with an account of how the different 'stories' of restoring the sight to a blind man near Jericho, called in one of the narratives Bartimæus, and that of the restoration being administered to two men may have arisen. He tells us that probably Luke (the titles to the evangelists are always omitted—which sounds harsh in the ears of a Bible-loving Christian) had saved the oldest shape of the tale—some one else had picked up the name Bartimæus—these stories got told together as if of two people, and so the story would grow into what we find given in Matthew—or the Gospel bearing his name. And then the author goes on to illustrate how St. Matthew had done the same sort of thing in other places.

Having thus undermined the child's inherent belief that what he reads, however wonderful, in the Bible is absolutely true—and that by-and-bye he will be able to understand all the seeming discrepancies—the author proceeds to practically deny the miracle at all—as being a cure worked by other than natural causes—explaining it as having only a spiritual meaning. This implied commentary as a spiritual application to what such miracles are for the successors of apostles to imitate now, is very beautiful and true.

Happily, none of the other sermons touch on subjects in which such teaching is likely to find a place; but what should we have had if Mr. Geldart had preached to his children on the Resurrection and Ascension of Jesus Christ, or of the descent of the Holy Ghost upon His apostles?

Externally the book is beautifully printed and exquisitely got up—and were it not for number three—ought to have found its way into thousands of Christian families to the advantage and instruction of the children.

The Royal Map Books. No. 1, England. London: T. Nelson and Sons, Paternoster Row.

This is the first instalment of a new series of Atlas Geographies, and, though primarily designed for scholars, cannot fail to prove invaluable to young pupil-teachers. The plan of the work may thus be briefly described:—About four-fifths of each page is occupied by a beautifully-engraved special map, which is divided into squares of 100 miles, instead of the ordinary lines of latitude and longitude. *Underneath* the map, on the same page, appears the explanatory text, which practically enables the pupil to learn his geography from the map. Spaces are left for additional names, and the last page is ruled for the geography of 'My Own County,' a feature worthy of our warmest commendation. We have no hesitation in saying this is an *excellent* geography, and strongly recommend our readers to examine it. Indeed, we could wish it might find its way into every school in the kingdom.

The World at Home (Home Lesson Books). London: T. Nelson and Sons, Paternoster Row.

Our readers will remember that some little time ago we spoke in the highest terms of these new Geographical Readers. We have now received several Home Lesson Books designed to be used in conjunction with them. In a word, they are everything that could be desired. Infant-school teachers will be delighted with the admirable writing copies—white on black ground—which embellish the little book for the First Standard.

The World at Home. Standard IV. London: T. Nelson and Sons, Paternoster Row.

Of the earlier volumes in this excellent series of geographical readers, we have spoken in terms of the highest praise. The volume now before us maintains in all respects the rare merit of its predecessors. It is an admirable reading-book, beautifully and appropriately illustrated. The explanatory notes, etc., are just what children need. Another valuable feature which should commend the book to the notice of teachers in these days of over-pressure is that, while containing ample matter for the Standard for which it is designed, it is *not too long*. This new volume is a worthy addition to the 'Royal Series.'

Johnston's Standard Mental Arithmetic Cards. In Seven Packets for the Seven Standards. London: A. Johnston, Paternoster Buildings.

We predict that teachers will hail with pleasure the publication of these new and valuable mental arithmetic cards. Each packet—inclosed in strong cloth case—consists of forty-eight different cards, with five test questions

on each, and two copies of answers, the accuracy of which may be relied on. The following method for using the cards is recommended by the author :—

First Course.—Take Card 1, read Question 1, and explain the way to work it mentally—writing the numbers on the blackboard and making full use of it. Give a similar question orally, noting the numbers on the blackboard. Let the class sit with 'hands behind' or stand 'at attention.' Allow about a minute. 'Answer down' and 'show up,' altogether and immediately. Follow the same course throughout the packet, gradually dropping the assistance at discretion.

Second Course.—Give each pupil a card. Allow about five minutes to write the five answers. Watch keenly to prevent 'working.' Discourage 'fingering' in the earlier Standards. 'Turn slates' (or papers). While the teacher is examining, the class may work a mechanical sum on the reverse side. An intermediate course may be made by writing a single 'card' on the blackboard.

The systematic use of these cards cannot fail to improve the arithmetic in any school.

Bowden's Pocket Code. By Charles Bowden. Newcastle: R. J. Porteus and Co., Limited.

This is a new and improved edition of Mr. Bowden's admirably arranged pocket code—a convenient and useful little work which every teacher should have. The author's aim has been—

(*a*) To place in the hands of every teacher in the school the daily requirements of the Mundella Code.

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(*c*) To provide in connection therewith a note book to record any instructions given or received either as regards lessons or classes throughout the year.

(*d*) And generally to serve as a handy means of reference to the daily routine work of the school.

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The Standard Authors' Readers. Primer I., Primer II.A, Primer II.; Infant Reader (abridged), Infant Reader, Enlarged Infant Reader, Standards V. and VI.

This is a new and really *excellent* series of reading books, which we propose to notice fully in our next issue.

Longmans' Magazine. May and June, 1883. London: Longmans and Co.

These are two excellent parts of an excellent serial. The May number contains an interesting and highly instructive article by Dr. Wilson, on 'Human Resemblances to Lower Life.' To the June issue the Rev. M. G. Watkins contributes a charmingly-written paper, entitled 'May Fly-Fishing.'

*** *Several reviews are crowded out.*

From Messrs. Longmans and Co. we have received a new and important reading-book, entitled 'Readings in Social Economy,' by Mrs. F. Fenwick Miller, Member of the London School Board. We hope to notice the book fully in our next issue.

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'I cannot help expressing my great pleasure at making their acquaintance. They are equal, as ordinary school Readers, to any now in the market, but as supplementary Readers they will be invaluable, being so well calculated to relieve the tedium of school drudgery.'
Mr. MOULD, Brayton School, Selby.

'I think they are capital: but the strongest testimony I can give you as to their answering the purpose for which they were written is to be found in the avidity with which my children read them.'
Mr. STATHER, Hillhouse Board Schools, Huddersfield.

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